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Agriculture.

THE MONEY-MAKING VALUE OF GOOD BREEDING IN CROPS AND STOCK.

BY CUTHBERT POTTS, B.A., Principal of the Queensland Agricultural College.

[Paper read before the Wide Bay and Burnett Pastoral and Agricultural Society.]

It can be taken as a self-evident truth that the object of each man on the land is to make money. Each man's farm or holding is purely a business into which he has put a certain amount of capital, and on which he expends each year a considerable amount of money and work. The returns each year, or, rather, the average returns over a number of years, should be sufficient (*a*) to cover interest on the capital invested, (*b*) to pay an adequate wage for all labour expended on the farm, (*c*) to cover the annual expenditure on seed, manure, utensils, repairs, &c.—in fact, all those expenses incidental to the running of the farm—(*d*) to provide a reserve to cover depreciation of buildings, equipment, and working stock, and (*e*) to yield some surplus for the purpose of expansion and development.

This statement seems to be quite obvious and simple. And if anyone cared to run a farm with paid labour only, then a set of books would have to be kept setting forth accurately each of the above-mentioned items. The simplicity of the question, however, immediately disappears when we consider the case of a man working his own property. Here the man's own labour, and often the labour of his family, is put into the property without any fixed monetary value being allocated to it. Thus part of such labour may reasonably be devoted to improvements, and the money value of this should rightly be set against the capital invested. Again, some of the work done will be assuredly devoted to repairs or to some other item of farm work, and it should be recorded against that special section at its full monetary value. In this way only can we hope to get a clear idea of whether a farm is paying legitimate profits or not. Instead of adopting any such system of clear book-keeping, the general farmer merely takes his net revenue at the end of the year or at odd times during the year, as represented by his balance at the bank. He is certainly not in a position to say whether his and his family's labour has or has not earned a fair daily or hourly wage. I think it is because of the lack of definite ideas in this regard that farmers generally are so careless about their labour. They have no clear idea of the value of their day's work, and so, in a vast number of cases,

they unconsciously place their labour at a very low figure. This must be the case, or else we would not find so many farmers willingly wasting a great deal of effort.

There are several ways in which a farmer may waste effort. For example, he may prepare his land for planting in a careless and indifferent manner, with the result that no crop has a chance to grow and yield a satisfactory harvest. This low return gives the measure for the payment of the labour expended. In many such cases a little extra cultivation, a little extra labour given to the preparation of the land, would have ensured a double or threefold crop.

In a similar way a farm can be badly or well laid out. If badly designed it is quite possible that both man and beast are called on to waste a fair amount of each day, say, in travelling to and from paddocks, opening and shutting numerous badly constructed gates, and so on. This question of planning the farm is of much more importance than would appear on the surface, and it is so recognised in the U.S.A., where they have developed the profession of "rural engineer" for the express purpose of assisting farmers to reconstruct the layout of their farms.

However, I do not wish to speak of these two ways of wasting effort. Where such wastage takes place it is generally quite evident if the individual will merely stop and think and study his own work. The particular form of wastage of effort I wish to speak about is that which is due to the use of poor-bred seeds and stock. Here the wastage of effort is not so self-evident, yet there is no other section of the farm where a greater wastage of time and labour can be involved. Reversing the statement, we might put it this way:—Nothing makes so greatly for prosperity on the farm as well-bred seeds and stock.

SEED BREEDING.

Let me deal with seeds first. How often do we see a man spend a large amount of effort in preparing land for planting and then find that he has purchased the very cheapest seed available in order to plant. Surely this is deliberately putting a low price on his labour. If seed is cheap it is natural to suppose that it is also inferior. It may not be true to name; that is, it may contain considerable quantities of varieties which are unsuitable for the district, or it may be weak in germination. In either case a poor crop is almost certain to result. To wilfully accept a low yield of crop can only have one effect: it must put a low valuation on the labour expended in the preparation of the land, harvesting, and other activities. That is, the man who buys poor seed deliberately rates his labour at a low figure, and in consequence has no right to complain if his farming operations show no fair profits. Or we might put the matter this way: Suppose a man has engaged all the labour required to grow the crop and has paid this labour a fair wage, he would have no right to try and cut down the wages merely because he purchased such poor seed that the resulting crop was unpayable. The fault would be entirely the employer's, because he had been "penny wise and pound foolish" in his expenditure on seed. Now I want to emphasise the fact that this matter of well-bred seed of high productive value is a big thing. Good seed may easily give from 25 per cent. to 50 per cent. greater yield than poor seed, and this for no other expenditure than that involved in the slightly higher price paid for the seed.

To illustrate this we might mention the work that has been done in several other countries, notably Sweden, Canada, and Denmark. In Sweden, which was a grain-exporting country, it was found by 1870 that the competition from overseas began to be felt to such an extent as to threaten the prosperity of the graingrowers of the country. In 1886 the Swedish Seed Association was formed for the purpose of developing better yielding varieties, and the Society's work resolved itself into:—

(*a*) Procuring good yielding varieties from other countries;
(*b*) Finding the best yielding native varieties;
(*c*) Growing these side by side and comparing their yields;
(*d*) Eliminating the poor varieties and propagating the good till a stock had been accumulated;
(*e*) Keeping the good varieties pure and purifying the impure; and
(*f*) Distributing the good seed amongst members and other farmers.

This association acquired land at Svalöf, and for the first ten or twelve years it accomplished little beyond the finding and testing of varieties and the keeping of the best of these up to the standard of purity. Attempts were made to improve some varieties, but with little success. Later, however, Professor Nilsson was appointed in charge, and he, in the light of later knowledge of the laws governing breeding which had recently been discovered, introduced new methods, with the result that Sweden now has improved varieties of cereals which are capable of giving up to 50 per cent. better yields than were given by the best of the old varieties.

Somewhat similar results have been obtained with a variety of crops in Canada, Denmark, Germany, several of the United States, and in Australia with regard to our wheats. But while some of these countries have well-established co-operative societies, whose efforts are devoted to the propagation of pure types and the improvement of varieties, others, like Australia, depend on a few Government farms and Government-paid experts to carry out this vitally important work of improvement, and leave the distribution of the improved varieties to our commercial seedsmen. It is in this latter regard that our system is so weak. It would not be possible within the limits of a single article to give a full description of how this weakness arises, but I will endeavour to give some indication of it, as the matter is so important. Suppose we take a variety of wheat which might have been created, say, by the late Mr. Wm. Farrer. After a number of years of ordinary paddock sowing it can be expected that rogues, that is, foreign strains of wheat, will find their way into the crop. These rogues may, and often do, closely resemble the particular variety grown; that is, as far as the seed appearance goes. But they may differ very widely from the type, both as regards yield and disease resistance. Thus what was a good pure variety is almost certain, with time, to become a mixture of strains. When this happens we say that that variety has run out. In the vast majority of cases these so-called run-out varieties could be re-established under a proper system of pure breeding at a well-equipped seed-propagating station. Above I have spoken of wheat, which is a normally self-fertilising plant. We have a totally different case when we consider crops such as maize, pumpkins, sorghums, and other plants, which are normally cross-fertilised, or which cross-fertilise easily. In these cases varieties may be quickly lost, or be so hybridised as to become of low value. On the other hand, good and heavy-yielding types may very frequently be obtained by special selection in the field. Thus, with maize we have a very useful system of selection and propagation known as the remnant system. For this the first thing to do is to select in the field cobs from heavily yielding plants, but, above all, to select heavily yielding cobs. Next season one half of each cob is planted in a row, each cob being represented by a separate row. Each row is harvested separately, and the five heaviest yielding rows are selected for the propagation of the seed maize. For this purpose the original cobs are again resorted to; that is, the half of the cobs which were first selected in the field, and which gave the heaviest yield on trial. These five are then planted in hills, one seed from each cob in each hill, but the heaviest yielder in the centre of the other four. Repeat in as many hills as will give the amount of seed required for field planting. It is necessary to state that these hills must be well away from any other growing maize so as to obviate outside fertilisation. When the plants in the hills show the first signs of tasselling, each of the plants in each hill, except the centre or highest yielding plant, are de-tasselled. Thus it is secure that the four outside plants are fertilised by the central plant. The future seed is taken from the outside plants only in each hill.

Similar methods might be adopted for pumpkins, though the actual working arrangement would not be so simple as with maize. However, it is not necessary now to describe methods of improving seed; the control of this work is largely the work of experts. What is more immediately essential is the matter of the money-making value of well-bred seed, and I think it is obvious that it would pay to give double price for our seed, always provided we could be sure that its yielding qualities were of a high order. On the other hand, poor seed can only be expensive, no matter how low a price at which it is bought. The only point to be considered is: How can we act so as to ensure that we shall get the high quality seed required?

First, all must be prepared to pay a higher price for their seeds.

Second, everyone must insist on seeing that the seed sold is up to the standard advertised. In this respect it must be remembered that the Queensland Government has a Pure Seeds Act in existence, which can do much to assist us, provided we will take the trouble to insist that all our seed shall not only be guaranteed as up to sample, but is also occasionally tested or retested so as to ensure that the guarantee is correct.

Third, cut out entirely the purchase of seeds of unknown origin.

Fourth, form among ourselves a Good Seeds Association and keep it a live body. Collectively one can secure much more protection than if one attempted to act individually.

As a Good Seeds Association, keep in view the probability of establishing our own seed-propagating farm, with or without Government assistance.

The "Agricultural Gazette of New South Wales" says:—The regulations of the Canadian Pure Seeds Association are as follow:—

"1. Membership of the association is open and free to any *bonâ fide* farmer who has shown himself capable of producing improved pure seed.

"2. The farmer who undertakes to grow pure seed obtains his foundation stock from the Association. Such seed is either 'first generation registered seed' (*i.e.*, the first, second, or third generation progeny of an improved selected strain) or 'elite stock seed' (a pure stock of seed originating from a single plant, or obtained from a hand-selected seed plot).

"3. Any seed of any kind of crop produced or selected by a member during the succeeding years is entitled to registration by the Association.

"4. Two kinds of certificates are given by the Association—(1) for seed which has been grown according to regulations, and descended from 'elite stock seed,' such seed being marked 'registered seed' and (2) for pure 'elite stock seed.'

"5. No certificates are issued unless the seed be (*a*) pure as to variety and true to type; (*b*) free from seeds of other cultivated plants; (*c*) free from seeds of weeds coming within the meaning of the term 'noxious weeds' as applied by the Seed Control Act; (*d*) free from or containing not more than a total of one seed of other weeds of minor importance; (*e*) well matured, clean, sound, plump, of good size and colour, and free from disease; (*f*) up to the percentage standard of vitality recognised for good seed of the kind under the Seed Control Act.

"The methods thus outlined are eminently successful. Already the membership of the Association runs into considerable numbers, and the demand for 'registered seed' is greater than the supply.

"The Department of Agriculture in New South Wales has already taken the initial steps for the production of better seed, and the lines upon which it is proceeding have already been indicated in the 'Gazette.' The method adopted differs from those in Canada and Sweden in the fact that the Department deals directly with the farmer. The principle of producing pure improved seed is such a vital one that the scheme merits the attention and co-operation of all good farmers."

STOCK BREEDING.

Here we have exactly the same argument as before, viz., that the man who is willing to work with poor quality stock is willing to accept a low wage for his labour. With stock this is even more obvious than with seeds. Further, it lies in the hands of each man to be his own improver, which is not the case always with plants. However, co-operation is of undoubted advantage in any district just as it is in the case of developing good seeds.

To illustrate this argument I am taking dairy stock, not because dairy animals are the only ones affected, but because the yield from dairy stock is so easily measured, and because we have many reliable figures upon which to base our argument. Thus we know that a great number of so-called dairy cows produce less than 150 lb. of butter per year, while others give higher yields, until we have the Australian record producer, Melba 15th, a cow that has recently put up the splendid record of 1,150 lb. of commercial butter in the 365 days. Naturally, Melba 15th was specially cared for and fed, but we know of many animals which are capable of putting up 400 or even 500 lb. of butter in the year with no better care or pasturage than that given to the 150-lb. cow. Not to exaggerate the argument, let us compare the 400-lb. cows with those yielding only 150 lb. of butter per year. I use the 150-lb. cow as the lower limit because the indications are that this figure is somewhere near the average yield for all dairy cows in Queensland.

Let us assume that one man can look after and milk fifteen cows, each giving 150 lb. of butter per year. Also let us assume that each cow requires 3 acres of grazing, the rental value of which is 10s. per acre per year. Let us finally assume that the value of each pound of butter is 1s. 3d. Then for our fifteen cows of 150 lb. capacity we have the following financial statement:—

	£	s.	d.
Cost of labour for care of animals and milking, say ..	130	0	0
Cost of grazing for each cow is 3 acres at 10s. = 30s.; therefore cost of grazing for the 15 cows is	22	10	0
Total	£152	10	0

or £10 3s. 4d. per cow.

The returns per cow = 150 lb. of butter at 1s. 3d. per lb. = £9 7s. 6d. Now, if the man is the owner of the cows and is doing his own work, he will not have actually paid out the assumed £130 in wages. If he had he would have made a loss of 15s. 10d. per cow per year, or a total of £9 12s. 6d. for the fifteen cows. What this really means is that the owner of the cows did not actually lose; he was merely content to accept £130, less £9 12s. 6d., or £120 7s. 6d., as a reward for his labour.

Let us now consider the case of a herd of cows each giving 400 lb. of butter per year. We will assume all the above figures, except that we will presume that a man can only look after and milk twelve of these heavier milkers.

In this case the financial statement runs out as follows:—

	£	s.	d.
Cost of labour for care and milking, say	130	0	0
Cost of pasturage for the 12 cows—30s. per cow as before ..	18	0	0
Total	£140	0	0

or £12 6s. 8d. per cow.

The returns per cow are 400 lb. of butter at 1s. 3d. per lb., a total of £25, or £300 for the twelve cows. Thus, if the man is the owner and is doing his own work, he would not have to value his labour as low as £130. Instead, he would be able to value his labour at £300, less the £18 for pasturage, or at £282 per year. In truth he would have put a value on his labour of nearly two and a-half times that which it is necessary to place on the labour of the man with the fifteen cows which only produce 150 lb. of butter each per year.

It may be claimed that the high producers would be very expensive to buy, and so they should be if they were proved animals. But one would not secure these high producers by direct purchase. It is doubtful if one could, even if he wished to and had the necessary cash. There is another way in which we get such good animals, but more of this later. Before going on, however, I should like to state that I know of a case at a factory in the Lockyer district where a man milking fifteen cows has been drawing for months past a cheque of £45 or more, while a neighbour of his who is milking, roughly, an average of forty-five is not drawing as big a monthly cheque. Thus the figures worked out above are no exaggeration on cases that we find in actual practice.

But let us consider the case of a man running beef stock. In this class of animal it is possible to have some that will not mature or be fit for market until they are five years of age, while at the other extreme we can get some which can be prepared for market at eighteen months, and which will then be heavier than the poorer class at five years of age. Let us set out an example similar to that for good and poor dairy stock, and again, so as not to exaggerate the case, let us take a class of animal which mature at four years old as against a better class which mature at three years. Suppose that a man has a property which will run 400 head. With the poorer quality stock he should be able to market 100 head per year, provided he intends to market a regular number each year. On the other hand, if he had stocked up with the better quality animals he would be able to market an average of 133 head per year. Granted that the animals are of the same value at the time of marketing, though in all probability the younger stock would command the better prices, we have an annual return for the poorer stock of £1,000 per year, and for the better stock of £1,300, on the assumption of a market value of £10 per head. This shows a difference of £300 in favour of the better class animal, with no increased cost for care and management and pasturage. Certainly the better class stock would be more expensive if they were purchased for stocking-up purposes, but, even so, they would scarcely be £2 per head dearer as weaners than the poorer quality stock. But here again, as with the dairy stock, a man would not buy his high class animals; he would adopt the cheaper method of breeding them.

Now let me return to a dairy herd to indicate how it is possible for each man to improve his milkers.

1. The first essential is that each cow should be tested each year to see exactly what she is giving. Any cow below the standard one sets for one's self should be culled. She costs money to keep instead of making money for the owner. Or, to put it another way, she gives such a low return that she lowers the available wage for the working owner.

2. The next step is to secure a bull from a high-producing family. To ensure this it is necessary that the production of the dam, the g. dam, and, if possible, the gg. dam, should be known. Also the production of the bull's sire's dam and g. dam. To obtain this information it is obvious that consistent testing of animals must have been going on for a number of years.

3. It is next necessary to test the production of each of the heifers produced, and she should yield as highly as her dam, or higher, or else the bull is not doing any improving; that is, the bull you buy must be tested through his heifers.

4. The bull bought should be a pure-bred, and bulls to follow him should be of the same breed. I do not intend to deal with the reasons for this, as it would take another complete paper to do so. Here I can only state it for a fact, always provided the pure-bred bull satisfies condition 2.

5. Once a bull has been proved to be a great improver, and occasionally a bull will be discovered which is such, he should be used to the utmost of his vigour. If not by his first owner, then by succeeding owners, who should be only too anxious to get hold of a proved sire.

It is evident that the discovery of such an effective sire would be greatly assisted if a number of men in any one district were all working on the same lines and were using bulls of the same pure breed. Further, this would render the sale of a proved sire easier of accomplishment.

In short, the foregoing suggestion boils down to the advice to form a proper herd testing and breeding association. That such an association can accomplish much is indicated by the following:—

Denmark has been testing her cows for over half a century, and it is authoritatively stated that the estimated yield per cow was 80 lb. in 1864, 116 lb. in 1887, and 220 lb. of butter in 1908. This is a gain of nearly 300 per cent.

Recently Mr. Singleton, Assistant Director of the Dairy Division of the New Zealand Government, published the following figures:—

He said that at the last census they had 793,215 dairy cows for 1916-17 season. He estimated the average yield per cow at 161.8 lb.of butter-fat (about 195 lb. of commercial butter) as against 142.1 lb. of butter-fat (about 171.2 lb. of commercial butter) for 1910-11, or an increase of 23.8 lb. of commercial butter per cow in six years. This represented an increased export value of £1,276,000, besides an increase in the by-products. Mr. Singleton gave figures to show the good results of the Department's testing to assist the farmers to cull their herds. One man was getting more butter-fat from twenty-five cows than previously he got from fifty-four cows.

The foregoing speaks for itself, and indicates what can be accomplished from consistent herd-testing. Similar work is being carried out in Victoria and New South Wales.

The statement quoted, however, does not truly represent what can be accomplished, for it only deals with the averages, and it can be taken that the greater number of dairy farmers are either too careless or are so adversely placed that consistent herd-testing cannot be carried out. Therefore the improvement in those herds which do practise testing must be much greater than the figures indicate. Thus, we know of a few privately owned herds which average over 400 lb. of butter per cow per year. These men have attained their position by careful testing and culling and breeding for the best. What they can do, all can do, but much more easily if they combine in a well-organised herd testing and breeding association.

ELEPHANT GRASS AS A FODDER, AND NOTES ON SOME OTHER FODDERS.

By J. C. BRUNNICH.

Elephant grass (Pennisetum purpureum), also called Napier's fodder, one of the introduced South African grasses, has recently gained some prominence amongst farmers, inasmuch that it yields heavy crops and does not appear to be much affected by droughty conditions.

Special claims for its great feeding value at all stages of growth have been made, and in order to ascertain the truth of such statements several samples, of various stages of growth, from different localities, were obtained and analysed.

The analyses given below clearly show that only very young elephant grass can be classed as a fodder of fair quality, which has, however, only about half the value of couch grasses or of prairie grass as a feed for cows, and that with age the food value rapidly declines and becomes very low when maturity is reached. The protein contents of this grass are low and not as good as of sorghum or of sugar-cane tops, but about equal to that of Indian or cow cane. Most of our grasses, sorghums, &c., are deficient in proteins, the most valuable flesh-forming constituent of foods, and only few fodders like lucerne, cow pea vines, salt bush, sheep's burnett, and couch grass contain a sufficient amount of proteins for balanced rations, whereas the rations of the former must be supplemented with sufficient amounts of concentrated foods, like linseed meal, cotton seed meal, sunlight oil cake, bran, dried blood meal, &c., to get a properly balanced food ration.

A well-balanced ration for a cow should have a nutritive or albuminoid ratio of $1 \div 5$, which means the ration should contain one part of digestible protein or albuminoid to five parts of digestible non-nitrogenous nutrients, including sugar, starch, cellulose, or fibre and fat.

The best method to judge the food value of any fodder in a simple practical way is based on the amounts of fodder required to furnish an animal with the necessary amount of nutrients, and for this purpose a cow of 750 lb. to 900 lb. live weight, yielding about 25 lb. of milk daily, is taken as a basis for calculation. Such a cow requires per day an amount of fodder containing at least about 1.9 lb. or nearly 2 lb. of digestible protein, and about 11 lb. of starch value, which includes all the digestible carbohydrates like sugar, starch, fibre, and also fat, calculated as starch.

In a ration which is properly balanced the amounts of food required to furnish the absolutely necessary amounts of proteins and of non-nitrogenous nutrients, briefly expressed as starch value, should be approximately the same, and we find in the table below that 71 and 79 lb. of couch grass are required for the ration of a cow containing the necessary amounts of nutrients, whereas 132 lb. and 183 lb. of very young elephant grass, and 29 lb. and 380 lb. respectively of mature elephant grass must be fed to give the same amounts of nutrients. The amount of 29 lb. giving the necessary starch value would be found in practice very much higher, on account of the coarseness and hardness of the fibre in the mature elephant grass, which would require a lot of extra energy for mastication and digestion.

—	Moisture.	Crude Protein.	Carbo-hydrates.	Crude Fibre.	Crude Fat.	Crude Ash.	Nutritive Ratio.	Lb. of Fodder to give:	
								11 lb. of Starch.	1·9 lb. of Protein.
Elephant Grass—	%	%	%	%	%	%		Lb.	Lb.
2 weeks old	85·5	2·1	6·4	4·3	·10	1·6	1 . 7·4	132	183
4 weeks old	83·5	1·3	6·6	6·1	·14	2·4	1 : 14·0	75	297
8 weeks old	78·1	1·7	9·2	7·4	·23	3·4	1 : 14·3	73	229
Mature	73·1	1·4	11·6	11·9	·19	1·8	1 : 23·2	46	268
6 months old (sticks up to 14 feet long)	70 0	1·0	13·8	13·2	·20	1·8	1 : 37·7	29	380
Couch Grass	74·1	4·1	10·0	8·4	·4	3·0	1 : 5·5	71	79
Sorghum	70·6	2·1	15·1	9·1	·6	2·5	1 : 17·9	58	158
Lucerne Hay	8·2	21·0	31·4	25·9	2·8	10·7	1 : 3·3	24	17
Linseed Meal Cake	10·0	36·1	36·7	8·4	3·6	5·2	1 : 1·4	16	6
Pollard	10·0	17·4	58·0	5·2	5·6	3·8	1 : 4·3	15	14

All the samples of elephant grass analysed, and besides them several other samples, including one of very young second cut, were tested for hydrocyanic (prussic) acid, and no trace could be found, so that it may be stated that elephant grass at all stages of growth does not contain a hydrocyanic acid yielding glucoside.

I take the opportunity of drawing attention to the use of many fodders, like most of the grasses belonging to the sorghum family, sweet potato vines, &c., which contain hydrocyanic acid yielding glucosides, as it happens frequently that farmers who successfully use many of these valuable fodders become careless at times, and fatalities among their stock occur.

One of our most valuable concentrated foods, particularly rich in proteins, is *linseed meal,* and although it is a well known fact that all samples of linseed meal contain a considerable amount of such poisonous glucosides, through simple carelessness it happens now and then, fortunately rarely, that calves have been killed by its use. The instructions with regard to preparation of the meal for feeding of calves, and particularly the quantities to be used for calves of various ages, must be strictly adhered to.

Among stock fed with *Soudan grass,* another of the introduced grasses, cases of death have been reported, but it has not been conclusively proved that such mortality was caused by the grass, or perhaps by Johnson grass growing among the Soudan grass. Several samples of Soudan grass, at various stages of growth, have been tested from time to time in our laboratory, but only very slight traces of prussic acid could be detected, so that the grass, under normal conditions of feeding, should be quite harmless.

A cross between Soudan grass and sorghum saccharatum, produced by Mr. Soutter on the Roma State Farm, was found, quite contrary to expectation, absolutely free from cyanogenetic glucoside at all periods of growth.

Saccaline, a saccharine sorghum, now extensively grown in many localities, contains rather large amounts of a poisonous glucoside, and even up to the time of full maturity of seed heads, dangerously large amounts appear to be present, so

that utmost caution must be used at all times when feeding this sorghum variety. In most other sorghums the amounts of poisonous glucoside diminish with maturity, and when seed heads are fully formed the amounts are so small that the sorghum can be used with absolute safety.

There can be no doubt that cattle fed with fodders containing hydrocyanic-acid-yielding glucosides can eliminate during the process of digestion a fairly large amount of hydrocyanic acid without feeling ill-effects. Only in cases when the animals are in poor health, or if very large quantities of such fodders are consumed during scarcity of other green foods, or by some reason or another, the evolution of the poison is much quicker during digestion than under normal conditions, fatal effects may be caused. It is, for instance, quite possible that, with the fodder containing the poisonous glucoside, another food is consumed which contains a similar poison, or perhaps large amounts of the emulsion, which causes the rapid breaking up of the glucoside during the process of digestion.

It must be again pointed out that wilting and drying of the fodder does not destroy the poisonous glucoside, and the reason why the dried fodders can apparently be fed with greater safety is simply due to the fact that the animal does not consume rapidly such large quantities of the dried fodder as of the succulent green material, and it is also possible that in the dried fodder the decomposition of the glucoside is not so rapid as in the green fodder.

Making any of these fodders into silage causes complete decomposition of the glucoside during the fermentive processes taking place in the silo.

ELEPHANT GRASS (PENNISETUM PURPUREUM): PULPING QUALITIES.

This grass is said to yield about 20 tons dry weight of material to the acre per season. It is a bamboo-like grass, and as received was very moist, the moisture content being 65.4 per cent. The height is about 7 ft., and numerous nodes occur along its length. The following shows the proportion in which the nodes, &c., occur:—

	Per cent.
Internodes	45.0
Nodes	29.0
Leaves	26.0

Its pulping qualities were tried in the small rotary digester, by the usual caustic soda process; particulars of treatment and the results obtained are:—

Caustic soda on the dry material strength of caustic being 77 per cent. sodium oxide (Na_2O)	22.0 per cent.
Period of digestion	6.5 hours.
Time in reaching maximum pressure	1.0 hour
At maximum pressure	5.5 hours
Steam pressure	80.0 lb.
Yields (based on materials and pulps being moisture-free)—	
Unbleached pulp	36.0 per cent.
Bleached pulp	30.0 per cent.
Bleaching powder (on weight of air-dry pulp)	15.0 per cent.
Average length of fibres	0.82 millimetres.
Average diameter of fibres	0.016 millimetres

The maximum length of fibres observed was 4.3 millimetres, but comparatively few were of such length; the minimum length was 0.35 m.m. and, as the largest proportion of fibres were in the vicinity of 0.5 m.m., this accounts for the low average of 0.82 m.m. The average diameter is also low, making for flexibility of fibres, which allows of easy felting together. Approximately 15 per cent. of the total cellulose consists of non-fibrous cells, which on account of their extreme degree of hydration is sometimes the cause of troubles on the machine. There are a few shive particles present, derived from knots which are fairly refractory. The pulp is considered to be not quite as high in quality as that from good quality straw, which has been carefully treated. The unbleached pulp would be far too expensive for wrapping paper, but there would be some prospects for the use of a proportion of same in covers and coloured papers. The presence of such a large quantity of moisture in the grass is objectionable; this would be reduced in amount by allowing the grass to further mature before cutting, but the knots would then become still more difficult to deal with. The yield of bleached pulp is not high, 1 ton pulp requiring about 3 tons 7 cwt. dry material, or 9½ tons moist grass. Taking the above into consideration, it is not thought that the prospects are at all promising for the use of this grass for pulping purposes.

QUEENSLAND AGRICULTURAL COLLEGE: DIPLOMA DAY, 1921.

June 10th was Diploma Day at the Queensland Agricultural College at Gatton, and, undeterred by torrential rain, a large and representative gathering, including visitors from various parts of Queensland and other States, assembled to witness the distribution of awards to successful students and to see something generally of College activities and, so far as the weather permitted, of dairy manufacturing and field operations.

The College was established in 1897 with three main objects: First, to provide sound training in the science and practice of agriculture, animal husbandry, and allied activities; second, to conduct experiments and investigations for the elucidation of agricultural problems; third, to establish stock studs from which pure-bred animals might be distributed at reasonable rates. All these objects have been achieved and continue in operation.

The College herds and flocks were paraded for the visitors' inspection, and everyone was struck by the uniformly high types of each particular breed. Later, a tour of inspection was made of the whole establishment, the general lay-out and equipment of which are strictly on the lines of economy and convenience.

PRESENTATION OF DIPLOMAS.

In the early afternoon the visitors, students, and their friends assembled in the College gymnasium, which had been prepared for the big event of the day—the presentation of diplomas. The Hon. W. N. Gillies, Minister for Agriculture, presided, and with him on the dais were Mr. Cuthbert Potts, B.A., Principal, and Mr. E. G. Scriven, Under Secretary.

The summarised points of the Principal's annual address were:—

The demand for agricultural education is growing, and its importance is being more widely recognised in our educational system right from the University down to Primary schools.

Of the ordinary students who have passed through the College, about 70 per cent. are now engaged in agriculture or allied industries.

A strenuous effort is being made to re-establish the College Old Boys' Union, which became moribund during the war.

The College Honour Roll lists the names of 200 ex-students and 35 members of the College staff.

The educational benefits of the College are not confined to students actually enrolled, and much important instruction is carried on by correspondence.

The number of visitors for the year was 1,020, the majority of whom were men who came for definite information on some branch of farming.

The College officers act as supervisors of practical field work as well as instructors.

There is a growing demand for the more general recognition of agriculture in the State educational system.

In the course of the year a move was made to establish an agricultural section in connection with the Lockyer High School at Gatton. This most important proposal came from the farmers of the Lockyer Valley. The design of the course is under consideration, and it is not expected to adversely affect the rural school movement. Agricultural education in connection with secondary schools will do much to check the cityward migration of country youth.

The Hon. W. N. Gillies affirmed that the science of agriculture is the most important subject on which the people of Queensland could engage thought. Other points of his address were:—

The experience of Great Britain during the war had driven home the importance of primary production.

Nature has been bountiful to Queensland in respect to rich and valuable soils and a generous climate that will respond in full measure to applied agricultural science. The possibilities of irrigation in the State are very great, and transport and methods of marketing claim equal attention. The Queensland Agricultural College is fulfilling a great purpose, and has an immensely beneficial influence on the State's development.

Mr. Gillies then presented the awards, congratulating each recipient on the honour he had attained. The successful students are:—

Diploma in Agriculture and Third Year Certificate in Agriculture.—J. A. Tait (Townsville).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—W. R. Straughan (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—A. W. McLuckie (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. S. Hall (Silverspur).

First Year Certificate in Agriculture.—A. Bray (Yorkshire).

First Year Certificate in Agriculture.—S. F. Murphy (Bowenville).

First Year Certificate in Agriculture.—K. M. Tait (Townsville).

First Year Certificate in Agriculture.—J. D. Land (Brisbane).

First Year Certificate in Agriculture.—T. Y. Bonar (Herberton).

First Year Certificate in Agriculture.—K. V. Henderson (Brisbane).

Diploma in Dairying, Second Year Certificate in Dairying.—W. B. Horneman (New Kareela, New South Wales).

Diploma in Dairying, Second Year Certificate in Dairying.—J. M. Irwin (Galala).

Diploma in Dairying, Second Year Certificate in Dairying.—N. A. Black (Neurum).

First Year Certificate in Dairying, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. V. Ward (Helidon).

Milk and Cream Testing Certificates.—B. T. Seymour (Biggenden), A. V. Clarkson (Brisbane), J. R. F. Zillman.

Third-class Engine-drivers' Certificate.—J. Pitceathly (Toowoomba), O. de Stokar (Dalby), R. V. Hodges (Calcutta, India).

COTTON SEED FOR SALE.

Dairymen who are hand feeding their milch cows and require a cheap and nutritious concentrate to add to the bulk foods used, have an excellent opportunity at the present time of purchasing cotton seed from the Department of Agriculture and Stock, William street, Brisbane, at £3 per ton at the Department, or £3 10s. per ton bagged on rails, Brisbane. *Remittance, with exchange added, should accompany order.*

The seed requires to be finely crushed before use.

Commercial cotton seed meal, prepared after the extraction of the principal part of the oil contained in the seed, is one of the richest and most valuable cattle foodstuffs. Its food value exceeds that of maize by 62 per cent., and wheat meal by 67 per cent.

An average analysis of cotton seed meal is as follows:—

	Per cent.
Water	7.80
Fat	9.31
* Protein (albuminoids, &c.)	42.00
Nitrogen free extract (carbohydrates, &c.)	28.83
Fibre	7.18
† ‡ Ash	5.88

Cotton seed, after reduction to the form of meal by passing it through a machine commonly used for crushing grain, is richer than cotton seed meal.

Ground cotton seed is used at the Agricultural College, Gatton, in quantities of from 1 to 3 lb. per cow per day, according to circumstances. Five pounds per day is to be regarded as a maximum amount for an animal in full milk.

Cotton seed prepared in this way is not attractive in appearance, owing to the short lengths of cotton lint present, these being found naturally adherent to the seed. As this is a vegetable fibre similar to other indigestible fibres found in vegetable matter commonly consumed by stock, it is not considered injurious to animals.

Cattle require a few days to become used to ground cotton seed, when mixed in their food, and should be gradually accustomed to the change of diet.

* Containing nitrogen = 6.72

† Containing phosphoric acid = 2.42

‡ Containing potash = 1.95

Pastoral.

STOMACH WORMS (STRONGYLUS CONTORTUS).

BY W. G. BROWN, Instructor in Sheep and Wool.

Last month a demonstration was given at Dalmally in respect to the experiments being carried out by the Special Blowfly Committee of the Institute of Science and Industry. Much information regarding sheep flies was given by the various speakers to a very representative gathering of Australian pastoralists. The writer seized the opportunity of issuing a warning on other pests; one especially, stomach worms, being almost as great a menace to the wellbeing of sheep in Queensland. In fact, it is a greater one, for there is sometimes respite from fly attack, but where the stomach worm is thoroughly established it is there all the time, and it is to be feared that the pest is now widespread in Queensland, not excluding the dry West. It is to be found on Peak Downs and Darling Downs, and in the Roma, Mitchell, and Charleville districts. Indeed, it is very difficult to say where it is not. The object of this article is to supplement a speech made at Dalmally, pointing out:—

(1) The danger to the wellbeing of Queensland flocks;
(2) The fallacy of the dry West not being favourable for the existence of the stomach worm;
(3) That the health of sheep governs to some extent blowfly infestation;
(4) Where to look for the parasite;
(5) The methods of combating the pest.

Like all introduced pests, little or no notice is taken at first of the spread of stomach worms. Sheep are doing well for a while and then for some unexplained reason they begin to fall off in a season when there is ample feed and water. They seem mopey and white faced, and, if driven hard, lie down. If driven further they probably die. There is no other disease in this, the healthiest stock country in Australia, so it is not hard to tell what ails the animals. They are wormy, and, being wormy, are infecting the whole country, for each female parasite lays from 1,500 to 2,000 eggs, and there are sometimes thousands of stomach worms in one animal. So the infestation of country is progressive. There is scarcely a district in Queensland where they cannot be found, though in many localities worms are comparatively few, and the sheep do not seem to suffer. Yet these few are the forerunners of many millions. Country is not naturally wormy. The pest must be introduced.

A fallacy many pastoralists cherish is that the dry West can never be the home of stomach worms. As a matter of fact they are strongly established there now, and every year sees an increase in their virulence. I have seen as bad a case as could be found on the Barcoo. Thanks to timely action on the part of the station-holder, however, they were soon exterminated on that particular holding.

There is no doubt that worm-infested sheep are more liable to fly attack than healthy sheep. Observation and experiment at Gindie State Farm and at Dalmally showed that conclusively. In fly infestation and also in worm infestation it is the weaners that suffer first and most. I know of a case where from 20 per cent. to 25 per cent. of the weaners died every year from worm attack. To-day the owner of that flock does not fear the pest, for he takes ample and timely measures against it, and his losses from that cause have now become negative. These measures I shall describe later.

HISTORY.

A short history of the life of *Strongylus contortus* as known to scientists informs us that the female lays eggs in the stomach of a sheep. These eggs pass out of the body in the excreta. They contain living embryos, which develop upon reaching moisture. The embryos moult three or four times after hatching, this process lasting from three days to four weeks according to the variation of humidity and warmth. The worms then climb the stalks of grass and await the coming of their host—a cud-chewing animal. The worms are swallowed with the grass. These, in the process of digestion, reach the fourth stomach, there again to copulate and lay eggs which pass out in the droppings, and the vicious circle is complete. It is known that the young worm is easily killed by cold or dryness, but when it is in the ensheathed or final form it may live for months until suitable conditions arise for its wellbeing. It is the ensheathed form which, endowed with length of life, matures in the stomach and produces eggs after intake by the sheep. It is in the fourth or true stomach where the parasite is found, and for the information of those who do not know where to look for the worms an illustration taken from "Sheep and its Cousins" (Lydekker) is reproduced. The worm itself is easily seen with the naked

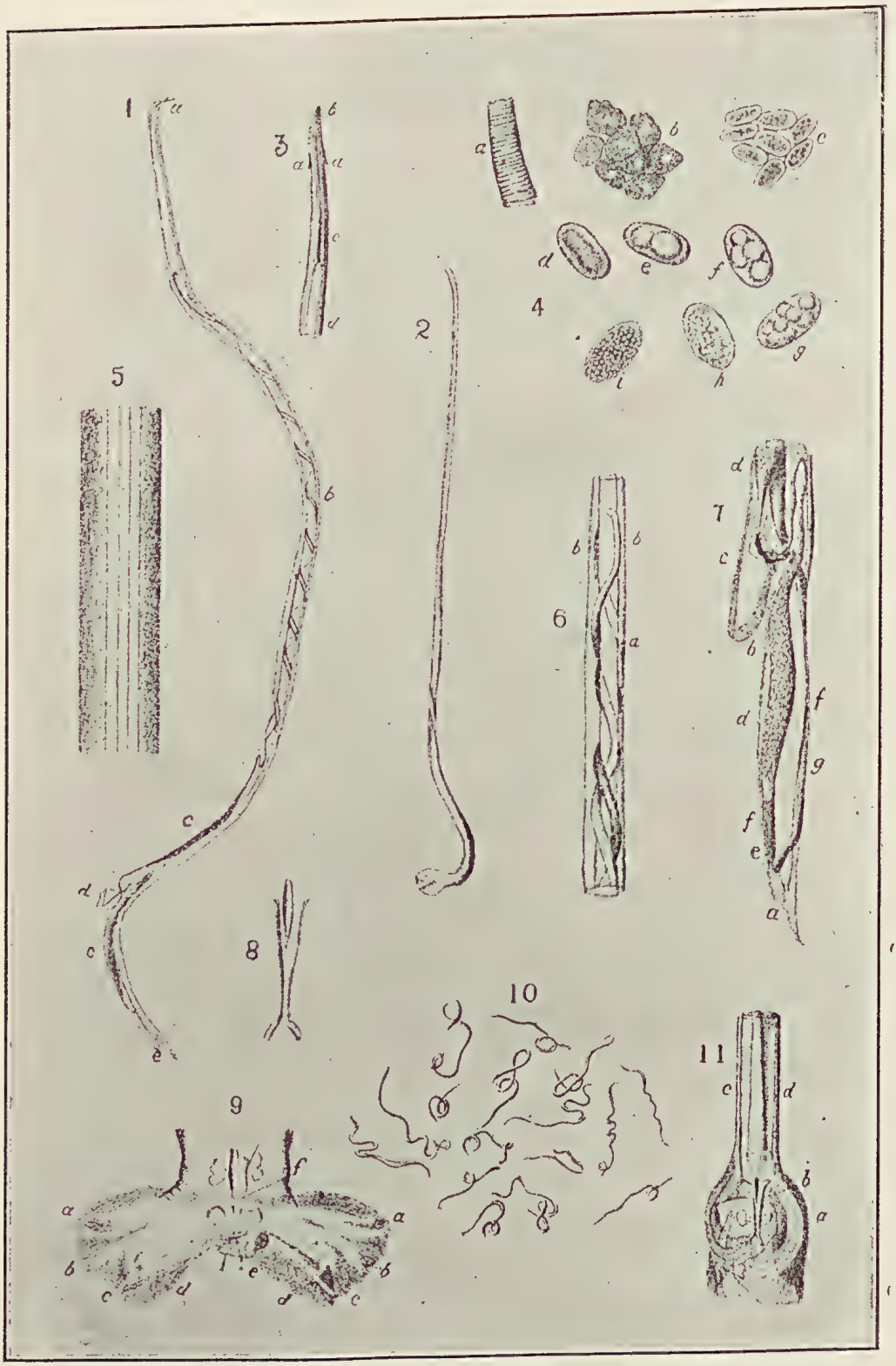
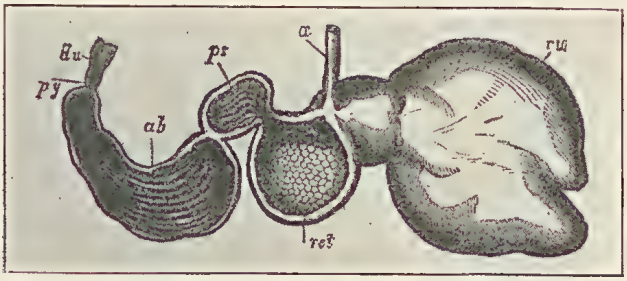


PLATE 1.—STRONGYLUS CONTORTIUS. (The Twisted Stomach-worm.)

eye. The female is about 1 inch long, and presents the appearance of a barber's pole with its white and red spirals. The male is much smaller, and is plain red without spirals.



Stomach of a Sheep, partially cut open to show Internal Structure

æ, œsophagus, or gullet; *ru*, rumen, or paunch; *ret*, reticulum, or honeycomb; *ps*, psalterium, or manyplies; *ab*, abomasum; *py*, pylorus; *du*, duodenum, or commencement of the small intestine.

METHODS OF EXTERMINATION.

Two practicable means may be used to clear land of the pest. One is to burn off the grass, one paddock at a time, and ensure that sheep introduced after the burning off are thoroughly drenched. It is idle to clear a paddock of worms if it is immediately afterwards restocked with infested sheep.

The second way is to quarantine a paddock for twelve months. Then the worms will die out for want of a host. It is worth while using a rotation of paddocks to get rid of so serious a menace as stomach worms. It will take time, but horses may be grazed in a paddock which is being spelled.

Drenching is a simple matter. A long race such as the ordinary branding race is best. The operator stands at one end, when the race is filled, and, throwing his leg over the shoulder of the animal, he lifts the lip with the left hand and introduces the mouth of the horn or bottle between the nippers and grinders of the animal, and, putting the horn or bottle well over the back of the tongue, he lets the liquid flow gently until the dose is swallowed. Sheep should be drenched on four legs, and the head kept nearly level during administration. It is all the better if the drench is warm, say, at blood temperature. The drench which I have found successful in the course of many years' experience is cheap and good, if proper care be taken in mixing. It is made up as follows:—

Arsenic (white)	2 oz.
Epsom salts	6 lb.
Water	5 gallons.

Boil 3 gallons of water in a 5-gallon drum, and when the water is boiling add the arsenic and salts. Boil for forty-five minutes, stirring occasionally. Then add cold water to make 5 gallons. The drench is then ready for immediate use. The doses are as follow:—

For grown sheep	2 fluid ounces
For hoggets	1½ fluid ounces
For lambs over 4 months	1 fluid ounce.

Sheep should be yarded for from fifteen to twenty-four hours before drenching, and should not be allowed to drink for four hours after.

A second drenching may be given in from seven to ten days. The arsenic used is really a tonic and cannot hurt the sheep if properly mixed, boiled, and administered.

DESCRIPTION OF PLATE.

STRONGYLUS CONTORTUS.

FIG. 1.—Adult female magnified six times: *a*, head; *b*, ovaries wound around intestines; *d*, papillæ.
FIG. 2.—Adult male magnified six times.
FIG. 3.—Head: *a*, two-barbed papillæ.
FIG. 4.—Eggs highly magnified: *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, different stages of development; *i*, egg as it is laid.
FIG. 5.—Skin showing nine of eighteen longitudinal lines.
FIG. 6.—Portion of female: *a*, intestines; *b*, *b*, end of ovary.
FIG. 7.—Caudal end of female: *a*, vulva; *b*, *c*, vagina; *d*, *d*, uteri filled with eggs; *e*, oviduct; *f*, *f*, ovary; *g*, intestines.
FIG. 8.—Spicula, enlarged.
FIG. 9.—Bursa expanded to show costæ.
FIG. 10.—Group of males and females; natural size.
FIG. 11.—Caudal end of male: *a*, bursa; *b*, spicula; *c*, seminal reservoir; *d*, intestine.

WOOL.

By ALEX. WYNNE, Assistant Instructor in Sheep and Wool.

HISTORICAL SKETCH.

Notes on Australian sheep and wool would be incomplete without reference to the pioneers of one of our greatest rural industries. To Captain Waterhouse is due much of the credit for the laying of the foundation of the Australian wool business. It was he who purchased thirty-two Spanish Merino sheep from a Mrs. Gordon, of Cape Colony. He succeeded in landing twenty-nine at Sydney, where their arrival created great interest; and Captain Macarthur was so impressed with them that he offered their importer fifteen guineas a head for the lot, but only succeeded in obtaining three rams and five ewes, the remainder being distributed among other settlers. Captain Macarthur's little flock formed the nucleus of a merino-breeding establishment that was to prove of the utmost importance to Australia. As his small flock increased, Macarthur noticed that the sheep improved in fleece and frame, and the pastoral possibilities of Australia so impressed him that, it is reported, he endeavoured to float a company with a capital of £20,000 in England for the purpose of developing the sheep and wool industry in the new colony. In this, however, he was unsuccessful, but, undeterred in his object of firmly establishing the industry, he purchased more merinos from the flock of King George III. Wool subsequently grown by Captain Macarthur was sold in London at 6s. per lb. The Yorkshire spinners were attracted by its manufacturing qualities, and eagerly sought it. Part of the building in which Australian wool was first milled near Bradford is, I noticed while recently in England, still standing. The Rev. Samuel Marsden was another who saw the great future of woolgrowing in Australia, and followed with success the lead set by Captain Macarthur.

It is interesting to observe that the foundation flock of our great sheep industry came from South Africa, and to-day South African breeders are now eagerly looking to Australia to supply stock for their own flock improvement.

FORMATION OF GROWTH OF WOOL FIBRE.

By way of illustration I have had reproduced four drawings (see plate) from F. H. Bowman's work "Structure of the Wool Fibre," and a photograph of a Corriedale wool staple plainly showing its character. Figure 1 shows the genesis of the fibre in a minute bag or sack known as the hair follicle. This follicle contains a plastic fluid which provides the cells that go to make up the fibre. The hair follicle is continuously fed with the fluid, the quantity of which is governed by the health and condition of the animal. Immature or defective cells naturally affect the strength of the fibre. It will be noticed that two glands are attached to the fibre; those are the Sebiparous glands which supply to the fibre the fatty substance known as yolk. This is a natural lubricant, and also supports the growing fleece. Its components are oil, lime, and potash. Other glands, Sudoriparous, drain the skin

FIG. 1.—SECTION OF SKIN.

of swint or sweat which is conveyed to the surface of the pelt, where it intermixes with the yolk in the fibre. Swint is composed principally of potash salts, a valuable by-product of scouring.

In the composition of the fibre are the Medulla cells which are located in the centre and form the Medullary canal. A longitudinal section of a hair fibre (Fig. 2)

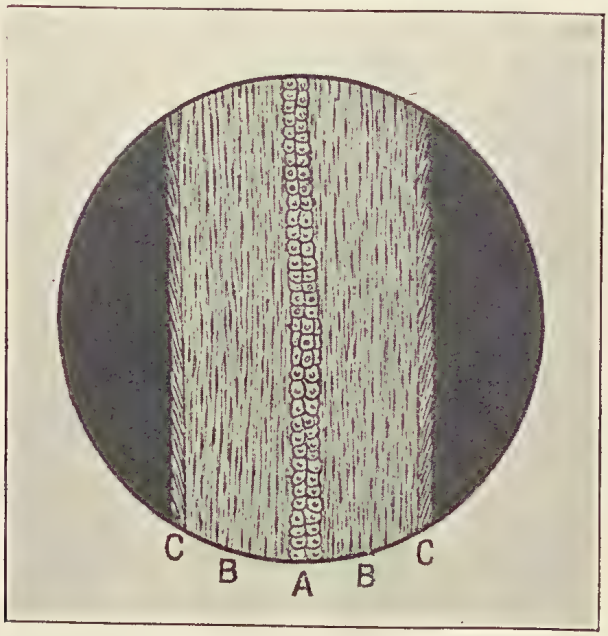


FIG. 2.—LONGITUDINAL SECTION OF HAIR.

shows this canal more plainly. Around the Medulla cells are two other sets of cells (see transection in Fig. 3). In addition are the outer Medullian cells (Fig. 4). The construction of cells in this minute hair follicle continues during the life of the

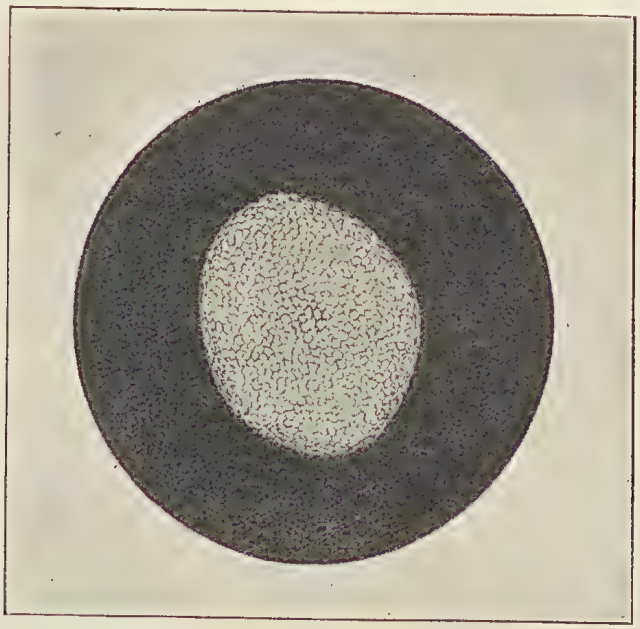


FIG. 3.—TRANSVERSE SECTION OF WOOL FIBRE.

sheep. These crowd out their predecessors in the form of a fibre on the surface of the skin. This crowding or pushing causes the crimps in the staple. The smaller the cell the greater the crimp. This action flattens the Medullian cells against the fibre (see Fig. 4) and is invisible to the naked eye.

As growers and others often confuse the two terms, crimps and serrations, I propose to define both, illustrating them by photograph (Fig. 5).

Crimps are the waves or undulations of the fibre.

Serrations are the pointed scaly coverings of the fibre caused by the flattening of the Medullian cells, which overlap from the base to the tip of the fibre and are invisible to unaided sight. These may be felt with a sensitive touch. By gently rubbing one's fingers from a staple tip to its base the edges will be felt to slightly grip; but if the finger movement is in the opposite direction, no grip will be sensed.

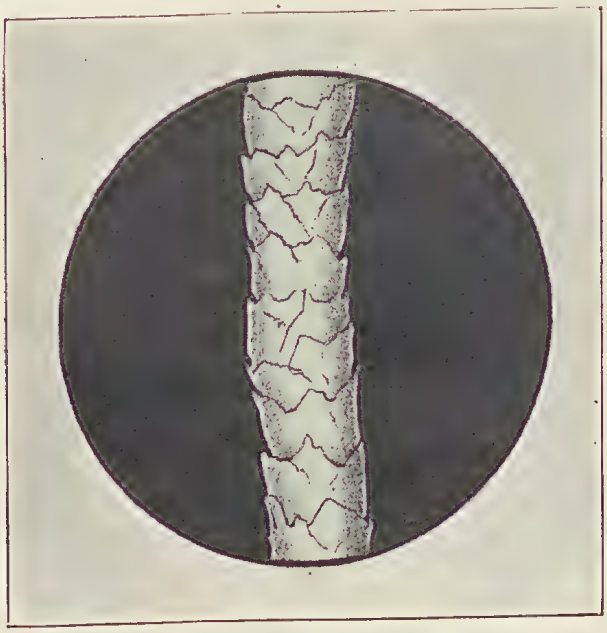


FIG. 4.—TYPICAL WOOL FIBRE.

It is obvious that, in order to get the best results, it is necessary for the wool-grower to bestow as much time and attention as possible to the welfare of his flock.

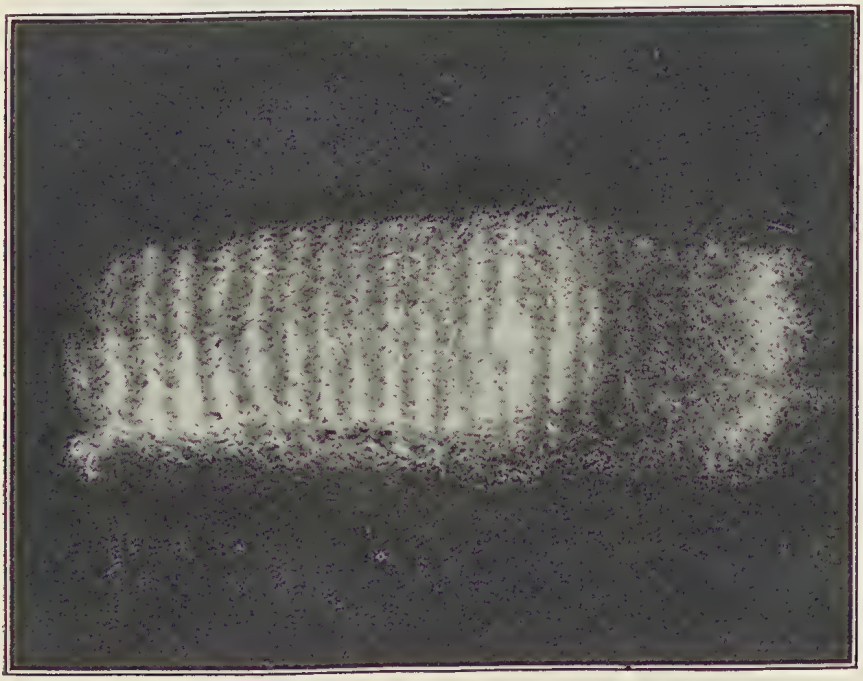


FIG. 5.—CRIMPS AND SERRATIONS.

BREEDS AND TYPES.

Every breed has its varying types; the same applies to covering. On this continent, with its diverse climatic conditions, no hard-and-fast rule can be laid down as to what breed or type is most suitable for a beginner in the pastoral industry.

The Merino we will discuss first. There are several factors that weigh in the decision as to the best type or variety of wool to grow, but it must be borne in mind that fine wool grows on a thin skin, and strong wool grows on a thick skin. Fine-woolled sheep, therefore, requires more beneficent conditions. For instance, in South-western Queensland, where the climatic conditions are sometimes severe, only an inexperienced grower would attempt to produce a fine-woolled animal. A medium to a strong fleeced sheep would, in that area, be more certain to fill the bales of the careful grower. The suitability of any locality for a particular type can be determined by local knowledge. A selector with limited experience would be ill-advised to attempt to breed his own rams. By doing so he would risk the propagation of nondescript and characterless types. Initial mistakes in this respect would take years of careful selection and breeding to correct. A better and more profitable course in the long run would be to secure rams of the type required from a reputable flock master.

WOOL *VERSUS* COTTON.

The old idea that wool is essentially the clothing of the West, while cotton is the clothing of the East, is undergoing revision. The Eastern peoples are demanding wool in greater quantity every year. The hygienic hydroscopic value of wool, *i.e.*, its more-ready absorption and retention of moisture, is being recognised more widely in Eastern countries, and its comfort as compared to cotton commends itself to inhabitants of tropical and sub-tropical countries. Its hydroscopic capacity is 18.4 per cent., compared to the 8.5 per cent. capacity of cotton. Where Eastern peoples formerly used very little wool they now import a big proportion of the Australian clip, and recent auction sales demonstrated the strength of Japan as a competitor for our best classes. From this trade development is drawn an obvious moral, and the necessity of maintaining and, if possible, improving our present high standards in sheep and wool production becomes apparent.

REPUTED POISONING OF SHEEP BY BUTTON GRASS.

In a letter from Barcarolle, Jundah, dated 9th May, 1921, Mr. F. L. Berney writes:—

"I have just lost a few sheep from their eating what at most times is the best of feed, and of this I am sending you two samples on the chance that you may consider an analysis worth while. The two plants sent are button grass and pig weed, both very common things, and the circumstances of the poisoning are as follows:—

> A small lot of sheep were yarded in a yard that had not been used for some months, and in which there was a dense and luxurious growth of the two above-mentioned plants—90 per cent. button grass and 10 per cent. pig weed; practically nothing else. They were left in all night, and the following day some of them showed symptoms of poisoning, staggered when they walked, and fell over. Half a dozen recovered during the following night, but two or three died.

"From a pamphlet on this subject I learn that of two lots of a plant under investigation one lot grown on highly fertilised soil developed a considerable amount of poison, while another lot grown on poor land showed little or no traces of it. The sheep yard that has been in use for some years would naturally become very rich from the accumulation of sheep manure."

Mr. C. T. White, F.L.S., Government Botanist, replies as follows:—

"The specimens when they reached me were too far advanced for a test to be satisfactorily carried out for the presence of a cyanophoric (prussic-acid-yielding glucoside). However, Dr. J. M. Petrie, the well-known investigator of Australian poisonous plants, in a list of tests made on Australian grasses, and published in Volume 38 of the Proceedings of the Linnean Society of New South Wales, has reported the fact that our common button grass (*Eleusine ægyptiaca*) is strongly cyanophoric at all times of the year, with the exception of the mid and late winter months.

"The note sent by Mr. Berney, however, is the first instance that has come under my notice where this grass has been definitely blamed as the cause of losses among stock in Queensland, and notes from the pastoralists on the subject would be welcomed."

The Horse.

CERTIFICATES OF SOUNDNESS.

Subjoined is a list of stallions registered and certified as sound, in the course of the month of May:—

Name of Horse.	Owner's Name and Address.
DRAUGHTS.	
Bute Baron (L)	J. W. Lowis, Waghorn st., Ipswich.
Royal Mac (L)	G. Myers, Kircubbin, Maryborough.
Prince (L)	J. Burgess, Bororen.
Saxon (L)	F. Hickman, Uplands, Bororen.
Operator (L)	G. Elliot, Laidley South.
King Boro'	J. A. Horrobin, Silver Dale, Tingoora.
BLOODS.	
Scottish King (L)	J. J. Little, Toogoolawah.
Firerack (L)	D. Vogel, Milbong.
Royal Form	T. Tuite, Toogoolawah.
LIGHT HORSES.	
Master Hall (L)	J. Baird, Toogoolawah.
Raporer (L)	W. J. Salmon, Harrisville.
PONIES.	
Master Badger II. (L)	W. A. Herrmann, Toogoolawah.
Cymro (L)	O. Davitt, Queen st., Newtown, Ipswich.
Pinto Ben (L)	W. Butcher, Oakhurst, Maryborough.
King Rufus	J. G. Reiser, Maroon, Boonah.

A RECIPE FOR BLACK WAX.

A South Burnett correspondent writes:—"The Farmers' Handbook of New South Wales," 3rd edition, contains a simpler recipe for making "Black Wax" than the one given in answer to a correspondent in the May Journal. Whether it is as good I cannot say, but I forward a copy for what it is worth. For "White thread," beeswax alone is used. For "Black thread," the mixture is 1 lb. pitch to 4 oz. of resin. The pitch and resin are heated until thoroughly liquified and intermingled, when the composition is poured into cold water in which it can be conveniently preserved.

When required for use, a piece about as big as the top of the thumb is cut off with a wet knife, and held while being used in a piece of soft leather to prevent it sticking to the fingers. These proportions of pitch and resin make a suitable wax for warm weather, but in winter it becomes hard and brittle. This can be overcome by making a mixture of the following:—1 lb. pitch, 3 oz. resin, 3 oz. mutton fat. The thread sometimes becomes hard and sticky when cold and will not run well. This can be remedied by smearing the fingers with raw beef or mutton fat, passing them up and down the thread a few times.

Dairying.

FRUITY FLAVOURS IN MILK AND CHEESE.

BY R. SNELL, Instructor in Cheese Making.

(An epitome of a Paper read before the Annual Conference of the Queensland Butter and Cheese Factory Managers' Association.)

DESCRIPTION.

Fruity flavours take their name from the peculiar odours they emit, that of certain ripe fruits, such as pineapple and strawberry, and not from the flavour they leave on the palate. To the palate they are sweet, sickly flavours, and are by no means pleasant. They are very hard to detect by taste or smell in the milk as delivered to a cheese factory, and seldom make their presence known until the cheese-making process is well advanced. As the cheese matures they develop into a very strong unpleasant smell and taste.

CAUSES.

Like many other defective flavours in cheese, fruity flavours are bacterial. Specific bacteria gain access to the milk from outside sources. They are not, as many suppose, transmitted to the milk through the system of the cow, but are carried into the milk through the medium of dust and dirt.

SOURCE OF CONTAMINATION.

Fruity flavours are closely associated with other undesirable flavours in milk and cheese, and a most prolific source of contamination is an organism known as Bacillus Coli Communis. The natural habitat of this organism is the intestines of all animals. Hence it becomes apparent that milk may be quickly and badly contaminated by the dust and dirt of the cow yard, dust falling into the milk pail from the flanks and udders of cows, and milking with unwashed hands. Another source of contamination not known to every producer of milk are the first few streams drawn from the cow's udder. This milk is known to contain bacteria, which gain access thereto through the small duct at the end of the teats. This first milk contains very little fat, and is not of very great monetary value to the dairyman, and therefore should be rejected. Vitiated atmosphere is undoubtedly another cause of contamination with fruity flavours.

I strongly advocate aeration, especially when cows are fed on strongly flavoured food. Aeration of milk should be thoroughly carried out both morning and evening. Aeration, however, will defeat its own object if not carried out properly. In the light of the foregoing as to sources of contamination, it is at once apparent that to aerate milk in the atmosphere of the cow yard, or in an atmosphere that has just previously passed over the cow yard, hog pen, fowl yard, or other odorous places, would be to invite contamination of what is otherwise pure milk. Milk should be thoroughly strained. I regret to say I have seen dairymen, who otherwise take very great care, devalue their product by the use of some unsuitable strainer. The practice of using a piece of cheese or other cloth is open to the severest condemnation, as is also the use of a strainer that cannot be dissembled for the purpose of cleansing. I have seen cloth strainers, even in otherwise clean dairies, so soiled as to spoil the best of milk. Yet another source of contamination of milk with fruity flavours is a dirty whey tank. Failure to empty and thoroughly cleanse and scald cans, foul factory drains, and lactic starters cannot be too strongly condemned.

PREVENTION.

Rules to observe for the prevention of fruity flavour are very clear. (1) Udders and flanks of cows should be freed as much as possible from dust and dirt, and the teats washed in clean water prior to milking. (2) Milkers should wash their hands after milking each cow. (3) Milk should be removed as soon as possible to a clean dairy house, and thoroughly aerated in a pure atmosphere. (4) The first few streams of milk from each teat should not be retained. (5) Strainers of cloth or strainers so constructed as not to admit of thorough cleansing, should not be used.

REMEDY.

The flavours should not be in the milk, and the remedy is in the hands of the dairyman. When the cheese maker suspects fruity flavours in his milk, he should use a good clean lactic starter. He should set the milk at such an acidity as to allow of the curd being well firmed before drawing the whey. If this is not possible he must use a fairly high cooking temperature. Develop a little more acidity than ordinarily before drawing the whey. Aerate the curd well after milling. The use of a little more salt than ordinarily is recommended, especially on curds that are inclined to be soft.

QUEENSLAND BUTTER AND CHEESE MANAGERS' ASSOCIATION.

ANNUAL CONFERENCE.

The members of the Queensland Butter and Cheese Managers' Association met in conference in Brisbane on 15th and 16th June. In the course of the proceedings many matters of importance bearing on two of the chief industries of the State were discussed.

Combined with the conference was an exhibition and competition in dairy products; thirty-five factories were represented. Mr. W. F. Uhlmann presided.

Dual Grading.—The conference viewed the existing system of dual grading with disfavour, and was of opinion that State control would prove more satisfactory than Federal control.

ADDRESSES.

Fruity Flavours in Cheese.—Mr. R. Snell, Instructor in Cheesemaking, Department of Agriculture and Stock, read a paper on the subject of "Fruity Flavours in Cheese," an abridgment of which appears elsewhere.

Mr. E. Graham, Chief Dairy Expert, outlined the new Dairy Act and Regulations which deal with every activity of the dairying industry and are in keeping with the general progress of the industry in recent years. The main points of his address were—

The new Act provides for returns from factories showing particulars of the quality of their products, and seeks to secure co-operation towards a general improvement of quality. The Act provides also for new powers in respect to insistence upon the cooling of milk intended for cheesemaking on farms, for special attention being given to cream subject to infrequent delivery, and for pasteurisation or aeration when considered necessary. When first and second grade products are received at the factory provision is made for separate receptacles for each grade.

Hon. W. N. Gillies, Minister for Agriculture, addressed the conference on various phases of the industry, and illustrated its importance with the following statistics:—Quantity of butter graded for export, 33,615,848 lb., value, £4,096,924. Butter consumed locally in Queensland, 16,016,000 lb. (approximate); value, £1,623,024. Total production of butter, 49,631,848 lb.; value, £5,719,948.

Quantity of cheese graded for export, 7,068,334 lb.; value, £382,868. Cheese consumed locally in Queensland, 2,000,000 lb. (approximate); value, £108,333. Total production of cheese, 9,068,334 lb. Value, £491,201.

Total value of butter and cheese manufactured for export and local consumption, £6,211,149.

Mr. M. A. O'Callaghan (Commonwealth Dairy Expert) remarked upon the present position of Australia in the butter world, and stressed the importance of continuing to market first quality product.

Mr. M. Wallace (Chief Commonwealth Grader) dealt with the manufacture and grading of cheese for export, and in the course of his remarks made the following points:—

The cheese now marketed on the other side of the world is not similar in quality to that sold locally. In order to manufacture a cheese which would have many of the characteristics of the Cheddar—one that would be palatable when a few months old—it is necessary that it should be made firmer than the cheese sold to local consumers. The sooner cheese goes into cold storage after it becomes dry the better.

The British grocer demands large cheeses about 70 or 80 lb. in weight. Cheese for export should be bright in colour, but not too much so. He favoured a cheese equal in breadth and height. Ninety per cent. of the low yield in summer may be attributed to over acidity. Uniformity in package and marking is essential. Faults in grading include faults in flavour headed by tainted and fruity flavours. Pasteurisation of whey and clean tanks assists in the avoidance of tainted flavours. The only remedy for fruity flavour rests in hygienic handling and the better cooking of the product.

THE EXHIBITION.

POINTS AWARDED.

The points awarded at the exhibition of dairy products held in conjunction with the conference are listed as under. The maximum number of points obtainable in each butter class was 100, proportioned as follows:—Flavour, 65; texture, 20; colour, 7; salting, 4; packing and finish, 4. In cheese the maximum number comprised:—Flavour, 50; texture, 25; colour and fiinsh, 25. The exhibits were judged by Mr. E. Graham, Chief Dairy Expert.

BUTTER.

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
CLASS NO. 1—EIGHT WEEKS STORAGE.						
Salted, Packed for Export.						
Downs Co-operative Dairy Co., Ltd., Toowoomba	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Dairy Co., Ltd., Boonah	58½	20	7	4	4	93½
Maryborough Co-operative Dairy Co., Ltd., Maryborough	54½	19½	7	4	4	88½
Caboolture Co-operative Co., Ltd., Caboolture	54	19	7	3½	3½	87
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	7	4	3	90½
Queensland Farmers' Co-operative Co., Ltd., Grantham	55	19½	7	4	4	89½
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19½	7	4	4	86½
Gayndah Co-operative Dairy Co., Ltd. ..	55	19½	7	3	4	88½
Oakey District Co-operative Butter Co., Ltd.	59	20	7	4	4	94
Queensland Farmers' Co-operative Co., Ltd., Booval	58½	19½	7	3½	3½	92
Warwick Butter and Dairy Co., Ltd., Mill Hill	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	3½	3½	89½
Caboolture Co-operative Co., Ltd., Pomona ..	53½	19½	7	3½	3½	87
Queensland Farmers' Co-operative Co., Ltd., Laidley	57	19½	7	3½	3½	90½
Downs Co-operative Dairy Co., Ltd., Crow's Nest	52½	19	7	3	3	84½
Warwick Butter and Dairy Co., Ltd., Texas	57	19	7	4	3	90
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	56½	19	7	4	3	89½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56½	19	7	4	3½	90
CLASS NO. 2—THIRTY DAYS STORED.						
Salted, Packed for Export.						
Warwick Butter and Dairy Co., Ltd., Texas ..	57	19	7	4	3	90
Caboolture Co-operative Co., Ltd., Pomona ..	56	19	7	4	3	89
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	57	19	7	4	3	90
Downs Co-operative Dairy Co., Ltd., Brook St.	59	19½	7	4	3	92½
Gayndah Co-operative Dairy Co., Ltd. ..	58	19½	7	4	3	91½
Queensland Farmers' Co-operative Co., Ltd., Laidley	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	4	3	89½
Oakey District Co-operative Butter Co. ..	55	19½	7	4	3	88½
Queensland Farmers' Co-operative Co., Ltd., Boonah	58½	20	7	4	4	93½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56	19½	7	4	3½	90
Maryborough Co-operative Dairy Co., Ltd., Maryborough	55	19	7	4	3½	88½
Queensland Farmers' Co-operative Co., Ltd., Grantham	57½	19½	7	4	4	92
Caboolture Co-operative Co., Ltd., Caboolture	53	19	7	3½	3½	86
Downs Co-operative Dairy Co., Ltd., Brook St.	56	19	7	3½	3½	89
Queensland Farmers' Co-operative Co., Ltd., Booval	57	19	7	3	3½	89½
Warwick Butter and Dairy Co., Ltd., Mill Hill	55	19	7	4	3	88
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19	7	4	3	85
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	6½	4	3	90

BUTTER—*continued.*

CLASS NO. 3—FRESH BUTTER.

Salted.

——	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Caboolture Co-operative Co., Pomona ..	57½	19	7	4	3	90½
Queensland Farmers', Boonah	59	20	7	4	4	94
Warwick Butter and Dairy Co., Mill Hill ..	57	19½	7	4	3	90½
Maryborough Co-operative Dairy Co., Kingaroy	58	19½	7	4	3	91½
Caboolture Co-operative Co., Caboolture ..	57½	19½	7	3	3	90
Warwick Butter and Dairy Co., Allora ..	57½	19½	7	3½	3	90½
Maryborough Co-operative Dairy Co., Maryborough	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Brook St. ..	57	19½	7	4	3½	91
Caboolture Co-operative Co., Eumundi ..	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Dalby ..	57	19½	7	4	3½	91
Queensland Farmers,' Grantham	58½	20	7	4	4	93½
Oakey District Co-operative	59½	20	7	4	4	94½
Downs Co-operative Dairy Co., Clifton ..	58	19½	7	4	3½	92
Queensland Farmers', Laidley	59	19	7	4	4	93
Downs Co-operative Dairy Co., Brook St. ..	58½	19	7	3½	3½	91½
Gayndah Co-operative Dairy Co.	58	20	7	4	3½	92½
Queensland Farmers,' Booval	57	19½	7	4	4	91½

CHEESE.

——	Flavour.	Texture.	Colour and Finish.	Total.
CLASS NO. 4.				
Two Export Cheese, Coloured, not less than 60 lb.				
Kooroongarra Co-operative Dairy Co.	43	30	19	92
Merrimac Co-operative Cheese Co., Ltd.	44	30	20	94
Downs Co-operative Dairy Co., Gowrie Junction	41	29	18	88
Downs Co-operative Dairy Co., " Unity," Westbrook	41	30	19	90
Downs Co-operative Dairy Co., " Unity," Jondaryan	39	29	19½	87½
Downs Co-operative Dairy Co., " Unity," Koondai	38	29	20	87
Downs Co-operative Dairy Co., " Unity," Hodgson Vale	44	30	19	93
Warwick Butter and Dairy Co., Ltd., Victoria Hill	42	30	19½	91½
Warwick Buttr and Dairy Co., Ltd., Bony Mountain	41½	29½	18½	89½
Warwick Butter and Dairy Co., Ltd., Talgai	40	30	20	90
CLASS NO. 5.				
Two Medium Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Talgai	40	30	19½	92½
Kooroongarra Co-operative Dairy Co., ...	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42½	29	19	90½
Pittsworth Dairy Co., Ltd., Brookstead	41½	30	20	91½
Warwick Butter and Dairy Co., Ltd., Bony Mountain	39	30	19	88
Downs Co-operative Dairy Co., Ltd., Jondaryan	40	29	19	88
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41½	30	19½	91
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91
CLASS NO. 6.				
Two Medium Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Talgai	40	30	20	90
Warwick Butter and Dairy Co., Bony Mountain	40	39	19	88
Downs Co-operative Dairy Co., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Jondaryan	41	30	19	90
Downs Co-operative Dairy Co., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Westbrook	43	30	20	93
CLASS NO. 7.				
Two Loaf Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	40	29	19½	88½
Kooroongarra Co-operative Dairy Co.	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42	29	19	90
Warwick Butter and Dairy Co., Ltd., Talgai	38	29½	19½	87
Pittsworth Dairy Co., Ltd., Brookstead	41	30	19½	90
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41	30	20	91½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Jondaryan	38	39	19	86
Downs Co-operative Dairy Co., Ltd., Westbrook	42	30	20	92

CHEESE—*continued.*

—	Flavour.	Texture.	Colour and Finish.	Total.
CLASS No. 8.				
Two Loaf Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	38	30	19½	86½
Warwick Butter and Dairy Co., Ltd., Talgai	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Jondaryan	38½	29	19½	87
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91

The Awards were as follow:—

BUTTER.

CLASS No. 1.—
- Oakey District Co-operative Co., Ltd. 1
- Queensland Farmers' Co-operative Dairy Co., Boonah 2
- Warwick Butter and Dairy Co., Ltd., Mill Hill 3

CLASS No. 2.—
- Queensland Farmers' Co-operative Co., Ltd., Boonah 1
- Queensland Farmers' Co-operative Co., Laidley 2
- Downs Co-operative Dairy Co., Ltd., Brook St. 3

CLASS No. 3.—
- Oakey District Co-operative Co., Ltd. 1
- Queensland Farmers' Co-operative Co., Boonah 2
- Queensland Farmers' Co-operative Co., Grantham 3

CHEESE.

CLASS No. 4.—
- Merrimac Co-operative Cheese Coy., Ltd. 1
- Downs Co-operative Dairy Co. "Unity," Hodgson Vale 2
- Kooroongarra Dairy Co-operative Co. 3

CLASS No. 5.—
- Warwick Butter and Dairy Co., Talgai 1
- Downs Co-operative Dairy Co., Hodgson Vale 2
- Pittsworth Dairy Co., Brookstead 3

CLASS No. 6.—
- Downs Co-operative Dairy Co., Westbrook 1

CLASS No. 7.—
- Downs Co-operative Dairy Co., Hodgson Vale 1

CLASS No. 8.—
- Warwick Butter and Dairy Co., Talgai 1

STRAWBERRY STALKING DEVICE.

Mr. H. G. Eckhardt, a strawberry grower, of Cleveland West, has patented a very ingenious device for cleanly picking strawberries. The main principle of the device is a steel cutter with V-shaped jaws. It makes a clean cut of the calyx from the fruit. After the berry is cut it drops on to a minute wire grid, through which drops all dirt and grit, and the berry passes cleanly into the picking tray or tin. The device is very simple, and is sure to become a useful and hygienic addition to the strawberry-grower's outfit.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MAY, 1921.

The laying in the group sections was excellent throughout the month. In the light group section only five pens out of the eighteen failed to pass the 100 mark, and five out of the twelve heavy group pens failed to secure the 100. The singles in most cases have been very choppy. Several times during the month they appeared to have settled down to work, but a couple of days of westerlies with cold nights put a number off the lay for several days. The health of the birds is excellent. The highest individual score was made by R. Burns's "F" bird with 29 eggs in thirty-one days. W. Becker's White Leghorn in "E" pen laid 27 for the month. The following are the individual records:—

Competitors.	Breed.	May.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	139	254
H. C. Thomas	Do.	133	215
F. Birchall	Do.	126	233
*G. Trapp	Do.	108	233
W. A. Watson	Do.	127	222
*W. and G. W. Hindes	Do.	92	215
R. C. Cole	Do.	105	204
*J. Newton	Do.	108	202
Oakleigh Poultry Farm	Do.	131	201
*C. M. Pickering	Do.	111	199
*Mrs. R. Hodge	Do.	93	197
*H. C. Towers	Do.	112	195
O. C. Goos	Do.	118	191
*H. Fraser	Do.	115	190
*J. M. Manson	Do.	116	190
*R. C. J. Turner	Do.	95	186
J. W. Short	Do.	106	175
Miss E. White	Do.	111	172
*C. Goos	Do.	88	172
*W. Becker	Do.	89	166
M. F. Newberry	Do.	103	162
E. Stephenson	Do.	102	158
*E. Chester	Do.	73	157
W. Barron	Do.	89	154

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	May.	Total.
LIGHT BREEDS—*continued.*			
Bathurst Poultry Farm	Do.	105	153
*Haden Poultry Farm	Do.	67	151
*T. Eyre	Do.	74	150
*T. Fanning	Do.	70	149
*Thos. Taylor	Do.	82	149
*W. and G. W. Hindes	Brown Leghorns... ...	88	149
*E. A. Smith	White Leghorns ...	79	143
*Mrs. L. Anderson	Do.	97	142
*S. L. Grenier	Do.	86	139
*B. Chester	Do.	80	137
Mrs. E. Z. Cutcliffe	Do.	82	134
*G. Williams	Do.	82	132
H. Stacey	Do.	101	118
Brampton Poultry Farm	Do.	35	104
W. N. Glover	Do.	59	94
Linquenda Poultry Farm	Do.	72	91
*H. P. Clarke	Do.	45	65
HEAVY BREEDS.			
Jas. Potter	Black Orpingtons ...	152	270
T. Fanning	Do.	129	259
Jas. Avery	Langshans	117	220
*J. Ferguson	Chinese Langshans ...	144	216
*A. E. Walters	Black Orpingtons ...	124	207
*T. Hindley	Do.	104	203
Jas. Ryan	Rhode Island Reds ...	125	201
Rev. A. McAllister	Black Orpingtons ...	109	196
G. Muir	Do.	120	196
*E. Morris	Do.	73	175
W. Becker	Langshans	63	169
*R. Holmes	Black Orpingtons ...	66	168
*C. C. Dennis	Do.	117	164
*E. Stephenson	Do.	83	163
*Parisian Poultry Farm...	Do.	76	159
*R. Burns	Do.	83	157
*E. F. Dennis	Do.	91	153
*H. M. Chaille	Do.	63	148
*J. A. Cornwell	Do.	105	140
G. Cumming	Do.	72	128
J. W. Newton	Do.	80	105
*Mrs. G. Kettle	Do.	66	94
*A. Shanks	Do.	65	85
*J. E. Smith	Do.	48	65
*E. Oakes	Do.	31	62
*N. A. Singer	Do.	38	57
F. Harrington	Rhode Island Reds ...	31	37
Tom C. Hart	Black Orpingtons ...	24	32
Total	...	6,293	11,102

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	41	30	36	43	44	39	233
W. and G. W. Hindes	45	21	39	46	45	19	215
J. Newton	33	40	39	22	40	28	202
C. M. Pickering	42	34	31	25	42	25	199
Mrs. R. Hodge	31	42	36	33	41	14	197
H. C. Towers	36	29	32	25	34	39	195
H. Fraser	41	27	32	22	38	30	190
J. M. Manson	26	41	35	24	39	25	190
R. C. J. Turner	31	24	29	30	32	40	186
C. Goos	27	43	8	19	24	51	172
W. Becker	19	35	34	24	45	9	166
E. Chester	23	37	23	24	25	25	157
Haden Poultry Farm	23	30	17	25	18	38	151
T. Eyre	25	15	22	32	34	22	150
T. Fanning	29	20	31	24	17	28	149
Thos. Taylor	30	34	20	10	18	37	149
W. and G. W. Hindes	16	14	22	39	27	31	149
E. A. Smith	42	21	31	8	19	22	143
Mrs. L. Anderson	23	27	23	22	29	18	142
S. L. Grenier	17	39	11	30	22	20	139
B. Chester	8	22	35	24	31	17	137
G. Williams	46	28	16	10	15	17	132
H. P. Clarke	34	6	7	1	0	17	65
HEAVY BREEDS.							
J. Ferguson	38	40	23	39	37	39	216
A. E. Walters	28	42	32	38	28	39	207
T. Hindley	45	27	37	30	36	28	203
E. Morris	33	33	13	41	17	38	175
R. Holmes	23	19	21	32	45	28	168
C. C. Dennis	37	18	7	37	37	28	164
E. Stephenson	32	23	35	18	21	34	163
Parisian Poultry Farm	22	25	25	45	7	35	159
R. Burns	18	13	49	5	39	38	157
E. F. Dennis	4	33	19	25	29	43	153
H. M. Chaille	3	42	21	46	36	0	148
J. A. Cornwell	28	4	27	29	27	25	140
Mrs. G. Kettle	4	27	35	0	0	28	94
A. Shanks	4	16	0	20	18	18	76
J. E. Smith	34	29	2	0	0	0	65
E. Oakes	0	26	0	36	0	0	62
N. A. Singer	6	2	9	7	0	33	57

CUTHBERT POTTS,
Principal.

PHALARIS.

Phalaris Bulbosa is described by the manager of the Bathurst (N.S.W.) experimental farm, as among the best winter grasses, and is therefore deserving of more attention from farmers. He is experiencing a strong demand for seed. A new grass from Africa, called wheat grass, is now undergoing trial at the farm, and, so far, it has proved promising.

The Orchard.

INTENSIVE CULTIVATION.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In a young country like Queensland, with its vast undeveloped areas, it may at first sight appear somewhat premature to advocate intensive cultivation, and yet when one considers the subject carefully it is very evident that one of the greatest mistakes our agronomists have made has been the tendency to acquire more land or to put a larger area under cultivation than they can possibly attend to.

This fault is not confined to one particular class, as there is a general tendency to grasp more land than the owners or lessees thereof can possibly utilise to the best advantage.

In no branch of agronomy is this more evident than in that of fruit culture, as many of the failures in this industry are directly attributable to the orchardist's attempting to handle a much larger area than he can manage, with the result that the yield of his fruit trees, vines, or other fruit-bearing plants is very much smaller than they would have been had they been given the care they required to produce a maximum return.

The importance of maintaining an orchard in a vigorous state of health and of maintaining the soil in a high state of fertility—in other words, the intensive cultivation of the orchard—has been pointed out by me in my writings on many previous occasions, as I have always maintained and still maintain that a small area properly looked after will frequently yield a greater net return than a much larger area that is more or less neglected.

During recent years there has been a very great increase in the number of small fruit holdings, both in the coastal districts of Southern and Central Queensland and also in the granite belt, a large proportion of the occupiers of such holdings being returned soldiers. These small holdings, if properly handled, are ample to support their owners in comfort, provided they are utilised to the best advantage; that is to say, that they are made to yield a maximum return.

This can only be accomplished by keeping the soil in a state of perfect tilth and in a high state of fertility, and by keeping the trees, vines, or other fruits free from disease and in a state of vigorous growth. These conditions can only be maintained on comparatively small areas, as they demand the constant attention of the orchardist, which they would not get did he attempt to handle a bigger area than he is capable of dealing with thoroughly.

The profits to be obtained by intensive cultivation would astonish those who have not gone into the matter carefully, as when land is kept in a high state of fertility and cultivation and is utilised to the best advantage it returns many times the yield it would do were it treated in the casual manner that many of our farms, orchards, and gardens are. To prove this, one has only to see the returns a Chinese market gardener gets off a small area which he works systematically and utilises to the best advantage.

Intensive cultivation demands two things:—One, the thorough preparation of the land and its maintenance in a state of perfect tilth; and the other, the maintenance of the fertility of the soil so that it contains an adequate supply of all essential plant foods in an available form. The former necessitates not only the working of the surface soil, but the deep stirring and pulverisation of the subsoil, so that the trees or fruit-producing plants grown thereon may be induced to root deeply, and thus be able to withstand dry spells much better than they would do were the majority of their roots near the surface.

The latter is not merely a matter of supplying the land with certain plant foods required as nutriment by the particular tree or plant, but, what is more important, the plant foods added to the soil must be available. No plant foods that are added to the soil in the form of commercial fertilisers can be made use of by any plant until they are dissolved in the water contained in the soil, as they can only enter the plant when in solution, and then only by means of the growing extremities of the finer roots.

It will thus be seen that, unless the soil retains an adequate supply of water, the application of artificial fertilisers will do little good, as the plant is unable to

PLATE 2.—BANANAS, MR W. E. DEAN'S FARM, BUDERIM MOUNTAIN.

make use of them. The retention of the necessary water in the soil is dependent first on the maintenance of the soil in a state of perfect tilth, so as to prevent the loss of moisture by surface evaporation; and, second, by keeping up the supply of humus or organic matter in the soil; as soils rich in humus have the power of absorbing and retaining more moisture than those that are deficient in this respect. Humus must be present in all soils in sufficient quantity, and when a deficiency occurs it must be made good either by the addition of farmyard manure or by the growing of suitable crops and ploughing them under—in other words, by green crop manuring.

Thorough cultivation and systematic manuring thus go hand in hand and are absolutely essential to the success of intensive cultivation.

Some years ago the Agricultural Chemist and the writer carried out a number of experiments for the purpose of determining the value of intensive cultivation as applied to the growing of bananas and pineapples, and the results of these experiments proved without a shadow of doubt that thoroughness in the culture of these two crops paid handsomely, and, further, that it was possible to so treat land that had been starved and neglected that it could be made to yield returns equal to those obtained from it in its virgin state.

Quite recently a further practical example of the results obtained by intensive cultivation has been brought under my notice, and, as the results are so satisfactory and show what good land properly treated is capable of producing, I purpose describing it for the benefit of our young growers, to many of whom it should be a valuable object lesson. In order that the description shall be as clear as possible, I am reproducing herewith photographs that were taken by Mr. Mobsby, the Departmental Artist, specially for this article, as they show better than any words of mine the effect of thoroughly preparing the land, maintaining it in a state of perfect tilth, and systematically manuring it.

The example to which I refer is on the property of Mr. W. E. Dean, Buderim Mountain, and consists of rather less than an acre of good volcanic soil that was originally scrub, and was first planted with bananas twenty-eight years ago. It remained under bananas for six years, when it was planted with paspalum and has since then been used as a grazing paddock, till broken up by Mr. Dean in 1919.

The paspalum when the land was broken up was saved, instead of being burnt, and was placed in the bottom of trenches 24 ft. apart, on the top of which banana suckers were subsequently planted 8 ft. apart in the row, or at the rate of 226 plants to an acre. Two hundred and nine suckers were planted in September, 1919. The land between the rows of bananas was well and deeply worked, and midway between the rows a double row of pineapples was planted, the lower side of the row being Ripleys and the upper smooths. The object of this method of planting the two varieties together was that the Ripleys, having a better hold of the ground, tend to keep the smooths from falling over. This principle is evidently a good one, as the plants of both varieties show a very healthy and vigorous growth; the colour is excellent, and they are bearing a heavy winter crop.

The soil is a deep volcanic loam from which the basalt stones and small boulders have been removed. It is in good heart, and, as previously stated, is kept in a thorough state of tilth.

During the spring of 1920 the land between the pineapples and the bananas produced a heavy crop of cucumbers, for which a very satisfactory price was obtained, and the cucumber crop was followed by peanuts which have recently been harvested, so that it will be seen that none of the land has been allowed to remain idle.

With regard to the bananas, selected suckers having large well-developed bulbs and a stem about 3 ft. 6 in. long were planted in September, 1919, and these mother plants bore their first bunches during the end of 1920 and early part of 1921. From the mother plant only three followers have been allowed to grow, and these at different intervals, and so spaced that no one sucker interferes with another. All superfluous suckers were removed by means of a spud bar some 4 ft. long and sharpened to a chisel point some 2¾ in. wide at one end. Such a tool does the work neatly and does not injure the parent bulb to any serious extent.

Of the 209 stools, each of the two oldest followers is now carrying a bunch, so that on less than an acre of land there are over 400 bunches, which average over 20 dozen individual fruits each, and one bunch had no less than 27½ dozen.

The photographs herewith give an excellent idea of the size of the plants and of the bunches, and the one looking up the centre between the rows shows that the bunches are on both sides of the row, or, as I have said, two to the stool. In one row the bunches are uncovered for the purpose of showing the fruit when taking the photo., but in the other row they are shown covered as a protection against cold nights.

PLATE 3.—A STOOL OF BANANAS, MR. DEAN'S FARM, BUDERIM.

The photograph showing a single stool, beside which Mr. Dean is standing, gives an even better idea of the growth; and the second follower in the foreground, which has made its entire growth during the present year, measures no less than 45 in. in circumference at the ground level.

The land is kept well worked right up to the pines and bananas, and there are no surface roots. The bananas are manured twice annually—the end of August and during February—when they receive either 2 lb. of dried blood, 1½ lb. of superphosphate, and 1 lb. of muriate of potash per stool at each application, or 4 lb. of meatworks manure and 1 lb. of muriate of potash per stool. The manures are distributed around the stools and are well worked into the soil, and cost at the rate of £25 15s. 9d. per acre. When the returns are taken into consideration, this is a reasonable expenditure; further, once the initial expense of preparing the land and planting the crops has been met, the upkeep of the land has been light, as it is in such good order that its cultivation is a simple matter. Horse, not hand, culture is employed, as there is no fear of damaging the roots.

The gross returns from this plot of land of less than an acre in extent will probably amount to over £400 in the year, provided the prices now being realised for bananas in the Southern markets are maintained, as the crop of fruit actually in sight is not far short of 300 cases, and, unless something at present unforeseen happens to destroy them, this quantity should be marketed. Mr. Dean's success is the result of good work well carried out, a striking example of the benefits to be derived from intensive cultivation, and a proof of my statement that a small area well worked will frequently yield a greater net return than a much larger area indifferently looked after. His success should also be an encouragement to many young growers who, instead of utilising their land to advantage, are frequently dissatisfied with the smallness of their holdings and think that they would do better if they had more land. In the majority of cases this is the greatest mistake they can make, as if they are not able to work a small area profitably they will have little chance of working a larger area to better advantage.

THE MARKETING OF FRUIT IN CALIFORNIA.

BY H. W. MOBSBY, F.R.S.A.

While in America as one of the Queensland representatives at the World's Fair at San Francisco in 1915 I was much impressed with the manner in which various fruits appeared in the city shop windows as they came in season. The product from the tree to the table had been properly graded, wrapped, packed, and displayed in the retail establishments in such an inviting way as to make its purchase irresistible. The high level of standardisation helped the fruit to sell itself, and made every buyer a "booster" for the home-grown product. One's curiosity as to Californian marketing methods was aroused and knowledge that might prove useful to the Queensland grower eagerly sought.

Being in San Francisco through the complete seasonal cycle and having observed how fruit retailing was done, I made it my business to call on the local executive of the California Fruitgrowers' Association. I was fully instructed on the Association's sale system and advertising campaigns, and obtained many samples and examples of its sale-compelling publicity.

I was informed that the Association was one big co-operative organisation, handling the production of some 6,000 growers (this number increased later to 8,000) and distributing and marketing through three systems. These were:—(1) Local associations of growers; (2) district exchanges; (3) Central or California Fruitgrowers' Exchange.

The three systems are organised and managed by the growers on a non-profit co-operative basis, each operating at cost, and each distributing the entire net proceeds to the growers after operating expenses are deducted.

(1) Local Associations or Exchanges.—The members (growers) usually organise as a corporation without profit under the laws of California, issuing stock to each member in proportion to his bearing acreage, to the number of boxes he ships, or in equal amounts to each grower.

The local association assembles the fruit in a packing-house and there grades, pools, packs, and prepares it for shipment. It is governed by a board of directors through a manager, and conducted exclusively for the benefit of the growers.

The fruit is pooled each month, each grower having his proportion of the proceeds received for each grade shipped.

Many of the associations pick the fruits, and some of them prune and fumigate trees for their members.

Each association has brands for each grade.

(2) District exchanges are corporations without profit. There may be one or more district exchanges, depending on the number of local associations. The district exchange acts as a clearing-house in marketing the fruit for the local associations through the Californian Fruitgrowers' Central Exchange, and as a medium through which most of the business relations between the exchanges and the local associations are conducted.

(3) The Californian Fruitgrowers' Exchange is formed of district exchanges governed by a board of seventeen directors through a general manager, one director representing each district exchange, and furnishes marketing facilities for the district exchange at a *pro rata* share of cost, places bonded agents in the principal markets of the United States and Canada, defines the duties of agents and exercises supervision over them, gathers information through them of conditions in each market, and receives telegraphic advices of the sales.

The exchange business is on a cash basis, makes prompt accounting of returns to the growers through the district exchanges, conducts extensive advertising campaigns to increase the demand for fruit, develops new markets, and performs other collateral functions between the Central Exchange and the district exchanges.

The Central Exchange levies an assessment against each district exchange for a *pro rata* share of the expense on the basis of the number of boxes shipped.

It does not buy or sell fruit or any other commodity, and exercises no control either directly or indirectly over sale or purchase, its function being to provide facilities for distribution and marketing of the fruit of those shippers who desire such facilities.

The Exchange being a democratic organisation, the growers exercise control over all matters and may withdraw from an association at the end of the year, or the association from a district exchange, or a district exchange from the Central Exchange. These relations are set forth in the various contracts that hold the members together.

The Exchange is organised into several divisions—Sales, Legal, Traffic, Advertising, Insurance and Mutual Protection, and a Supply Department, which furnishes the materials used in the packing-houses and on the ranches at cost to the members; and also directs an advertising campaign which is carried on in all important cities of the Union.

The expense of maintaining the Exchange, including advertising and every other expense, has never been higher than 3 per cent. of gross sales.

THE RIPE OLIVE: ITS FOOD VALUE.

Olives are harvested both ripe and green for pickling, as well as for oil. The ripe olive is too often considered as a relish than as a food. As to its food value there is no doubt as an examination of the following table showing the analysis (made by Professor M. E. Jaffa, University of California) of the ripe olive, green olive, pickles, bread, rice, and potatoes:—

Per pound.	Calories.
Olive, ripe	1,136
Olive, green	598
Pickles	110
Bread	1,215
Rice, raw	1,630
Rice, boiled	525
Potato, raw	385
Potato, boiled	440

The percentage of fat or oil is twice as much in the ripe olive than in the green olive. According to chemical analysis this appears to be the main difference between them. This, however, is not the only interesting point brought out by a study of the

table. Bread is generally considered to contain, weight for weight, far more nutriment than the olive, yet as far as total food value or heat unit is concerned, it will be noted that 1 lb. of ripe olives contains practically eleven-twelfths of the caloric value of bread.

Again, if the ripe olive is compared with raw rice, it will be seen that rice ranks far ahead in total food value—that is, in 1 lb. of raw rice we have much more nutriment than in 1 lb. of ripe olives. If, however, the rice is boiled its food value is reduced to practically half that of ripe olives.

It is not always correct, however, to compare food values on the basis of caloric content, because very often the real value of the food to the body depends on the ingredients more than the caloric value. For example, 1 lb. of sugar contains 820

PLATE 4.—A FRUITED SPRIG OF RIPE OLIVES GROWN AT DALMALLY, NEAR ROMA.

calories, 1 lb. of meat less than 1,000; yet one would hardly say that 1 lb. of sugar is equal to 1 lb. of meat where the question of growth is concerned.

Summarising, it may be said that the ripe olive is a very valuable, palatable, and easily digestible form of food, and should be considered as such and not as an accessory or condiment.

Olives find Queensland conditions very congenial, as may be judged by our illustration of a fruited olive branch grown in the homestead garden at Dalmally, Mr. W. A. Russell's property, near Roma. The photo is by Mr. H. W. Mobsby, F.R.S.A., of the Department of Agriculture.

DEHYDRATION.

Californian dehydrated fruit producers are (*vide* "California Grape Grower," April) strongly organising for the purpose of standardising, advertising, and otherwise controlling and directing the commercial side of their enterprise.

The points listed hereunder comprise an epitome of ideas expressed in the course of proceedings of a meeting of producers at San Francisco on 8th March last, and are cited for their topical interest.

POINTS FOR PRODUCERS.

Before any attempt is made to standardise dehydrated products, it will be necessary to standardise methods of production.

The demand for canned and dried fruits is insufficient to relieve market congestion in seasons of plenty. It is necessary, therefore, to seek to produce a dehydrated article that will create a distinct and separate demand—an article that is different from canned fruit and absolutely superior to sun-dried fruit.

It is desired to offer something tasty, absolutely sanitary; something that will occupy small space, will not spoil, and that will keep indefinitely.

The experimental stage of dehydration has passed. An article can now be produced thoroughly suited to the most exacting and refined taste.

Standardisation, either in methods of production or marketing, cannot be done individually. Associated effort on the part of dehydrated fruit producers is essential.

The public must be educated. People must be made familiar with the idea of dehydration, and popular demonstrations as to its forms and culinary use must be conducted at central points.

The question is not that it can be done, but how. Quality and uniformity of the product are essential if public demand is to be created. Quality of production alone determines the value of a dehydrating plant and its output.

Standardise and advertise.

At the meeting, the Pacific Coast Dehydration League was formed and an active organisation established to work along the lines suggested in the foregoing summary.

In the course of the week a parcel of dehydrated peaches was received at this office from Mr. R. G. Booth. The fruit was soaked in water for about twenty hours. Half was cooked in the water in which it had been soaked, and half in fresh water. In each instance the reconditioning as regards flavour, colour, and texture was good, though varying. That cooked in the water in which it had been soaked retained its full flavour and texture, and was equal in every respect to fresh fruit. That cooked in the second water was not equal in flesh texture or flavour to the other. It is apparent, then that, in order to retain the essential qualities of the product in the process of preparation for the table, it is advisable to use the first water, *i.e.*, the water in which it has been soaked.

Our illustrations show (1) a sample of dewatered peach in its treated form, and (2) the fruit reconditioned.

THE 1921 SUGAR CROP.

At the end of last year the indications were that a record sugar crop would be harvested during 1921. Due to various causes—too much rain and absence of humid heat in some districts, too little rain in others, and the severity of the grub pest in the Hambledon and Mulgrave areas—the original estimates have been much reduced. The present approximate estimate, we are informed by the General Superintendent of the Bureau of Sugar Experiment Stations (Mr. Easterby), is 250,000 tons of sugar. This, if realised, will be the best year Queensland has seen for sugar production, with the exception of 1917, when the yield was 307,000 tons. It may, therefore, be described as an exceedingly good crop.

Photo. Dept. Agriculture and Stock.]

PLATE 5.—DEHYDRATED PEACH.

1.—The Marketable Product.

2.—Reconditioned and Ready for Cooking.

(Natural size.)

Horticulture.

TREE PLANTING FOR SHADE AND SHELTER.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

A thing that strikes visitors from other countries to the rural districts of Queensland is the absence of trees. Of course, on the plain or downs country this is natural, but where trees were originally plentiful they in many cases have either all been cut down or ringbarked. This is, surely, evidence of a great lack of foresight in clearing operations. I know stockmen will say, "You can't have both trees and grass"; that may be so in a general way, but in forest country a few trees for shelter will benefit stock considerably. Many a wind-swept, sun-scorched paddock would be vastly improved by a judicious system of wind breaks—belts of individual, or small groups of trees here and there. On large holdings groups would be better. Fine examples of this may be seen in brigalow country where groves of these fine trees provide excellent shelter. The planting of trees or the preservation of indigenous timber has not received the attention it deserves, as the bare condition of many homesteads and paddocks testify. That stock appreciate shade is evident by the way in which on a hot summer day they may be seen seeking shelter from the sun, if it is only alongside a stunted bush or underneath a small tree. Even sheep on open country may be seen in the middle of a summer's day crowding along dry watercourses taking advantage of what shelter the stunted bushes afford. Another point that should not be overlooked is that in drought time judicious lopping would provide quite a lot of feed for stock. Even the Moreton Bay Fig, where it would grow, could be used for this purpose, and the Carob Bean (*Ceratonia siliqua*) planted as a shelter belt would provide a lot of nutritious fodder from its pods.

Where it is intended to plant lines or belts of trees the ground may be prepared by ploughing and subsoiling. Work it well to a fine tilth, then open the holes sufficiently large to spread out the roots of the plants. In such a belt, plant thickly, say 12 to 15 ft. apart, and two, three, or more lines diagonally, the object being to get a thick belt of trees in a short line. Groups may be planted in various shapes, such as triangle, crescent, or horseshoe, or other formations that may be desired; very large growing trees may be planted much further apart, say up to 40 or 50 ft. When planting, in opening the holes place top soil on one side, then remove the next layer and break up bottom of hole with a pick. If any dead grass or leaves are handy, put a layer in the bottom of the hole, then replace lower soil which, if very poor, may be much improved by the addition of some farmyard manure fairly well decomposed. Place the tree and fill in with the surface soil, tramp firmly around the roots, and leave a depression or "saucer" around the base of the young tree to hold water. Water well and mulch the surface lightly to graduate evaporation. July and August are good months to plant, for all kinds of trees, and are the only months for the planting of deciduous kinds. February and March are also good months for trees planted out of pots. Young trees must, of course, be protected from stock by either tree guards or fencing, and they will repay the trouble of keeping the surface free from grass or weeds by their better growth; also it will be a protection from fire. Watering occasionally will be necessary until the trees get a good hold of the ground.

In giving a list of what to plant, difficulty is experienced in keeping it from being too lengthy. For shelter belts grow *Araucaria Cunninghami* (hoop pine), *Callitris robusta* (cypress pine), carob bean (*Ceratonia siliqua*), *Olea Europea* (olive), *Eucalyptus tesselläris* (Moreton Bay ash), *Grevillea robusta* (silky oak), *Pinus longifolia* (Himalayan pine), Casuarinas (she-oaks), *Acacia aneura* (mulga), *Celtis australis*, and *Platanus orientalis* (plane tree), the two latter being deciduous.

For individual planting or small groups choose *Eucalyptus tessellaris*, *Ficus Benjamina* (weeping fig, warm districts), *Ficus Hillii* (Hill's weeping fig), *Ficus macrophylla* (Moreton Bay fig), *Flindersia australis* (crow's ash), *Gmelina Leichhardti* (Queensland beech), *Pinus longifolia*, and plane tree. For Western Downs and cold districts the best to plant are *Albizzia Lebbek*, *Schinus molle* (pepperina), *Melia composita* (white cedar), Kurrajong (*Sterculia diversifolia*), broad-leaved bottle tree (*Sterculia trichosiphon*), and *Sterculia rupestris* (narrow-leaved bottle tree).

GARDEN NOTES.

Rose pruning should have been finished last month, and the plants should now be making a good start. The first thing after pruning is to manure well with well-decayed manure; if this is not available, a good sprinkling of bonedust is beneficial. Work it well into the soil without unduly disturbing roots. Should dry weather prevail, do not let the plants suffer for want of water. Be particularly careful of newly planted roses, for many are lost after making their first growth through being allowed to dry and the plants being unable to stand a severe check. Keep a sharp lookout for insect pests and deal with them as they arise. Rub off any superfluous shoots such as those that grow across centre of plant; this will ease the annual pruning and benefit the plants.

Flowering shrubs not already pruned should be attended to at once, and beds prepared for summer flowering annuals. Keep the surface soil loose and in a good state of cultivation by running the dutch hoe over frequently.

This is about the best month to break up and replant old gerbera plants. Before lifting, cut off all the old leaves, leaving only the young or last ones; then lift and separate the "clumps" of old plants and replant. A change of position is beneficial. Work in a good sprinkling of lime through the soil and be careful not to bury the crowns.

Another planting-out of some of the hardier flowering plants can be made, such as antirrhinum, coreopsis, calliopsis, gaillardia, verbena, petunia, cornflower, and dianthus. Sowings of seed of aster, zinnias, amaranthus, celosia, petunia, balsams, and other summer-flowering annuals may be made.

STOCK POISONING BY "WHITE CEDAR" BERRIES—A REPORTED REMEDY.

Mr. Walter L. Guy, Rockhampton, writes:—

Just about twelve months ago I communicated with you about eleven young pigs poisoned by "White Cedar" berries.

Now I have just had a similar experience, but have been successful this time, and with the hope of helping other inquirers I will relate the details. Owing to congestion in my pigstyes I was forced to put 6 months old Berkshire pigs in a fowl run adjacent to which is growing a large White Cedar, which I value for its shade. Owing to business delay I did not arrive in time to feed the pigs. Getting hungry, they charged the wire netting and got at the berries. About an hour later I was able to attend to them, and immediately saw what had happened. Remembering my previous experience, I tried to think of the best way out. This is what I did: First of all I administered a big dose of castor oil to each, and this caused four to vomit a lot of berries. Half an hour later I gave them each a dose of Epsom salts, two packets per pig, in milk from a pint bottle. The dose was administered with each pig lying on its back with head held up. Two hours later they received a bran and hot milk mash, which had to be forced down their throats, as they were too sick to take it naturally. I heavily cut their ears to relieve blood pressure, as that symptom is first to show. I then prepared a deep warm bed for them, and at 9 p.m. administered 3s. worth of raw brandy mixed with three double handsful of bran formed into balls and forcibly fed. This on account of their evident suffering from shock and cold. The net result was that one died and the rest are alive and as well as ever. The one that died was harder to catch than the others and its treatment was delayed in consequence.

Tropical Industries.

1921 CANE CROP PROSPECTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, who has returned from a visit to the northern sugar districts of Mackay, Proserpine, Lower Burdekin, Innisfail, Babinda, and Cairns, comments as follows on the 1921 cane crop prospects:—

The anticipations of a record crop formed at the end of last year are not going to be fully realised. Excessive rain in some districts, insufficient rain on the Lower Burdekin, and grub damage at Cairns have checked growth. The crop all round, however, will be good.

At Mackay the crops have stooled out well and have a beautiful appearance, but the growth in length is disappointing. This is principally due to the fact that while the wet season has been very heavy there has not been sufficient hot and steamy weather this season to ensure a maximum growth of cane.

A comparison of the average maximum temperature in 1919, 1920, and 1921 for the first three months of the year shows the following results:—

	1919.	1920.	1921.
January	90.2	89.5	87.1
February	90.0	87.2	84.9
March	91.0	88.9	82.7

These statistics show that the temperatures in 1921 for February and March were considerably lower than in either 1919 or 1920, and must have had a marked influence on the making of the cane during the best growing period. The ratoon crop also is not so forward as usual. However, it is expected that a satisfactory yield of cane will be harvested, and the present estimated output of the mills is between 45,000 and 50,000 tons of sugar for Mackay district. New land is being brought under cultivation at Mackay principally to the south along the new line of railway to Rockhampton. There are about 3,000 acres of fine land near Carmilla, and a good deal of this is already settled and producing cane. The Plane Creek Central Mill are putting in about 4 miles of tramway from the main line to the area in question. About twenty settlers have taken up land, and it is expected that next season about 15,000 tons of cane will be sent in to the mill. There are other good pockets of land along this line which are also being brought under cane. The opening up of these new lands and the additional cane to be supplied to the Plane Creek Mill will add largely to the prosperity of the Mackay district, and will also increase our average sugar production.

The Sugar Experiment Station at Mackay is looking particularly well; and the growth of cane for the season upon the experiment plots is very satisfactory. The new West Indian canes are doing well, as are also the Java and Hawaiian canes. The annual field day of the station will be held on Saturday, 2nd July.

Due to the continued rain in the Mackay district, little or no early planting has been carried out.

At Proserpine the cane is also backward for the same reasons as are mentioned in connection with Mackay. Rain was falling every day during the time of inspection, and farmers were being sadly hampered in their preparatory cultivation. Due to this fact, the early planting this year will be negligible. The district of Kelsey Creek has very greatly improved and a number of new areas have been brought under cane. Some very fine crops of Badila were seen here along the creek banks. There is still a good deal of land in the Proserpine district that might profitably be put under cultivation when means of transport can be provided.

The transition from the wet districts of Mackay and Proserpine to the dry belt of the Lower Burdekin is particularly marked this year. After about a fortnight of rain and mud in the Mackay and Proserpine districts, the Lower Burdekin areas were found to be exceedingly dry and dusty. Since the beginning of the year only 15 in. of rain had fallen up to 30th April. This has been increased by a fall of 3 to 5 in. in May, while at Proserpine about 70 in. have been registered. These two districts are not very widely separated, but there is a vast difference in the climatic conditions. This appears due to the fact that there are no ranges of mountains

coming in close to the seaboard in the Ayr district. This district has, therefore, to rely upon irrigation, and if this is applied in time good crops are generally secured. Owing to its high cost, however, a temptation to wait for rain in the early part of the year, when it is most usual, manifests itself, and many growers hold off irrigating in the belief that rain will fall. When it fails to do so to any extent, as in this season, growers pay the penalty in reduced crops, while those whose faith was not so strong and who applied water early reap the benefit. The consequence this year is that those who did not irrigate early are doing so late, in order to save the crop, and many of the pumps were hard at work providing water for the cane. Although the cane is backward, for the most part it looks well and healthy. An interesting feature in this district is the introduction of windmills for irrigation. So far there are not many of these, and they are only being used on small areas. It is stated, however, that 24-ft. mills to work 18-inch pumps, giving a flow of 15,000 to 20,000 gallons per hour, are to be erected, and the work done by these mills will be watched with keen interest, as they should tend to considerably lessen the cost of the application of water. The experiment plot upon Mr. James Mackersie's farm was found to be progressing satisfactorily. New varieties from Java and Hawaii were sent up from the Bundaberg Sugar Experiment Station in April, and these had been planted out and had germinated well, the Hawaiian 227 being on the lead. On the Home Hill side of the river the cane, though backward (except where irrigated), is looking well. The completion of the electric power scheme in connection with irrigation is eagerly awaited, farmers at the present time being much handicapped under dry conditions. Varieties sent to the Lower Burdekin district from the Sugar Experiment Stations from time to time have been of the utmost benefit to this district, the main cropping sorts being the Badila and Gorus, which took the place of the Imperial Cane some fifteen years ago. Many of the Queensland varieties are also being grown, the high-density cane known as Q.813 doing very well.

Leaving the dry areas of the Lower Burdekin, the next district visited was Innisfail, which, with Babinda, is the wettest part of Australia, and this year the rainfall has been high. Up to the middle of May some 136 in. of rain had been precipitated at Innisfail. This heavy rainfall has undoubtedly checked the growth of the cane to some extent, while the softening of the soil and high winds have caused much of the cane to fall. Nevertheless, there is a fine crop in this district, and the cane is green and healthy. All the mills anticipate good crushings. Very little damage by grubs has occurred on the Johnstone this year. At the Sugar Experiment Station a very fine crop will be harvested. Badila cane six to seven months old, first ratoons, had all the appearance of a 40-ton per acre crop. The various experiments in fertilising, cultivation, and subsoiling all look magnificent, while the variety canes have also made astonishing growth considering the comparatively poor nature of the soil. Owing to the waterside workers' dispute at Mourilyan, the South Johnstone Sugar Mill had still 3,000 tons of last year's sugar to get away, and a good deal of this has deteriorated in the abnormally wet season. The Maria Creek soldiers' settlement is going ahead. Sixty-seven ex-service men are on the land so far, and twenty-one farms are now under cane. It is expected that 157 farms in the Innisfail side of the range will be taken up.

At Babinda the rainfall was found to be even greater than at Innisfail. Up to the 14th May some 186 in. had fallen. This enormous rainfall had caused floods, which had damaged the cane, about 120 acres being affected. Of this amount 30 per cent. is estimated to be damaged beyond recovery, but this is only a small percentage of the entire area. The damage by grubs in the Babinda area this year is, fortunately, not great, being principally confined to the northern end, about Fig Tree and McDonnell's Creek. The cane has a fine, healthy appearance, and the crops should cut well. The Babinda Mill expects to treat 150,000 tons.

At Cairns the devastation by grubs this year has been most deplorable. Old growers state that such an outbreak has never been seen for years. The principal damage has been at Green Hills and around Hambledon and Mulgrave, and it has resulted in the estimates of the Hambledon and Mulgrave mills being reduced by some 50,000 tons. This only shows the magnitude of the problem and the enormous losses that the unfortunate grower has to suffer in given years. Floods have also caused a good deal of damage on the Mulgrave flats. The cane not damaged by flood or grubs is looking magnificent, and comparatively large crops will be harvested both at Hambledon and Mulgrave. At the latter place many improvements have been made in the mill, and its capacity is being largely augmented in order to deal with about 50,000 tons more cane which, due to a re-arrangement of areas, is expected next year.

During the course of Mr. Easterby's tour seven lectures on cane-growing and increasing production were delivered. At the close of each meeting, all of which were well attended, discussions ensued, and a great deal of interest in the various questions of cane-growing, cultivation, and fertilising, was displayed.

It may be expected that, despite the checking of the growth by too much rain and damage by floods and grubs, the crop will be very much larger than any since 1917. This is mainly due to the drought having broken and to the increased areas that have been put under cane. In the course of the next week or so the Bureau will be in a position to issue an approximate estimate of the 1921 crop.

It is unfortunate that, owing to the very wet weather in North Queensland, very little early planting has been done this season, so that a great deal of leeway will have to be made up later in the year.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 8th June, 1921:—

During the past month a further inspection was made of the Mackay district, also Carmilla, and the Bundaberg and Avondale cane areas.

MACKAY.—This district was dealt with in last month's report, but an interesting tour over the Carmilla Creek country revealed some very fine cane land. This area is situated some 30 miles south of Sarina, and is not promising to look at from the railway siding, but on following the route of the new tramline, which is being built by the Plane Creek Milling Company, the hills fall back from the stream, and some thousands of acres of fine alluvial and forest flats are to be seen. Already new settlers are pushing in there, and the old-established ones are vigorously clearing and planting land hitherto used only for grazing.

The topsoil is deep and well drained, while the subsoil is mostly a porous loam. In the wet season there is a heavy seepage.

The timber growing on this country is mostly bloodwood and ironbark. There are plenty of other varieties, but these two are principally in evidence.

Of the cane already growing on Carmilla Creek, there are some very fine crops of D.1135 and 1900 Seedling. It is probable that these two canes could safely be grown as staple varieties. They are displaying all the characteristics of the best types, and are free from disease of any kind. Other canes would, however, do well, especially such varieties as Q.855, 813, 426, 285, Badila, N.G.24A and 24B.

The geological formation shows nothing apparently of outstanding importance. Many of the peaks are of volcanic origin, although not much of the agricultural country is of volcanic nature.

The spring water in this locality is good, and would be suitable for irrigation. There is always abundant water in Carmilla Creek.

Every facility for getting about was afforded me by the Plane Creek Company. This organisation is to be congratulated on the speedy erection of bridges and preliminary work in connection with the new tramline.

BUNDABERG.—In the Bundaberg district the cane looks well. The season has been a very good one, and the farmers should have nothing to complain of regarding tonnage.

The different Queensland seedlings mentioned in previous reports are going to give splendid results. Some very fine blocks of Q.813 are in evidence at the present time. 1900 Seedling looks well, although the ratoons are not so heavy in stool as they might be. On the Qunaba plantation Badila is making a good showing, although it is not growing to a perfect type of that variety such as seen round Cairns. Cane pests are not numerous. There appears to be a higher percentage of mortality among cane grubs this season than previously. Borers are being greatly checked, perhaps by the ravages of small ants, which are swarming in the cane.

On the areas north of Bundaberg equally favourable conditions prevail. Autumn-planted cane has struck well. There is no evident disease. Even canes usually susceptible to leaf infection have this year a normal healthy green colour. An insect parasite is attacking, in a minor way, the leaf midriff in D.1135.

Varieties mentioned in previous reports on these areas are all doing well, and should still make considerable headway between now and the end of June. A mild winter is anticipated.

AVONDALE AND MIARA.—Fine growing weather has prevailed for the last six weeks, and the tonnage at the time of cutting should be satisfactory. The growers have the upper hand regarding weeds, and are not worried with cane pests. Some of the autumn strikes of plant cane were not quite satisfactory, possibly the cause of this being that the farmers, anticipating a dry spell, covered too deeply.

At Avondale the canes looking best are D.1135, 1900 Seedling, and Yuban. The latter variety has taken a great hold of the ground and is ratooning well, but the canes are thin. It is not a cane to be recommended to the small farmer for planting, especially as there are several very good varieties already widely known that he can plant with better results.

At Miara such canes as B.208, N.G.40, 1900 Seedling, and D.1135 are all growing satisfactorily. There is some excellent cane-growing land in this locality, with a loose well drained subsoil. Much headway ought to be made here by the growers if they devote their time exclusively to cane culture. The principal difficulty is transportation.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 9th June, 1921:—

In the course of the month of May the following districts were visited:—

INNISFAIL.—Up to the 9th of May the rainfall for this area was 126.96 in. This excessive fall has been a very serious drawback to cultivation. The chief cane grown in the area is Badila and some very good plant crops of this are to be seen. H.Q.426 is only represented by a small percentage. It does not seem to do well in the wet areas and appears to be liable to disease. Very few other varieties are to be seen, but a number of farmers expressed their intention of planting a few of the new varieties from the South Johnstone Experimental Station.

Growers are now using lime to a greater extent than formerly and speak well of its effects upon the crops. Green manuring is also increasing in favour. Up to time of writing grubs or borers were not causing much trouble in this area.

SOUTH JOHNSTONE.—Some very fine crops of plant and ratoon cane are to be seen in this area. Upon both the red soils and alluvial excellent results should be obtained. Practically nearly all the cane is Badila with a small percentage of 24, 24A, 24B, and H.Q.426. Owing to the constant wet weather very little early planting has been possible. Borers are active. Grubs are also doing a certain amount of damage on red soil country, the most affected part being on the 17-mile area. This is mainly old banana country, and some of the farmers are having a bad time. One farmer here used arsenic at the rate of 2½ cwt. per acre on his plant cane. The land was cane holed, the plant laid down, and a little soil on top of it, and later on the dressing of arsenic and the balance of soil. The plant cane looks extremely well.

So far very few tractors are in use in this region as a very big area of the land has yet to be stumped.

Whilst at South Johnstone the Maria Creek Soldiers' Settlement was visited. There are about 24 settlers at work upon their blocks, and they will probably harvest about 100 acres of cane this year. The cane is backward in growth, due to continual wet weather and lack of warmth. The railway authorities expect to have the line through by the end of October or early in November.

BABINDA.—In this district the rainfall has been very heavy. Up to the end of May 187.38 in. were recorded. Farming work has been seriously delayed. Grubbing is being carried out in all parts of the area and the extent of cultivation for 1922 should be considerable. Plough teams and tractors are also very busy.

Although the rivers and creeks were in flood several times this year the damage caused was not as much as one would expect, only a few farmers being badly affected. Although grubs are to be seen they had not done a great deal of damage up to time of writing. Borers are still about, although evidently the parasitic flies have helped to keep them in check.

The principal cane grown is Badila of which about 90 per cent. will be harvested. Other canes are 24, 24A, 24B, H.Q.426, 1900 Seedling, D.1135, B.147, and B.208. Of these the Gorus seem to promise best results.

Very little manuring has so far been carried out in this area, but numerous growers intend using lime and artificial manures. Returns from the manured areas have so far been very satisfactory.

BOWEN.—The Bowen district was visited early in April and the cane areas adjoining the Don River were green and healthy, and should develop into good crops. The cane areas are very small, as fruit growing and mixed farming generally are mostly favoured. Farmers interviewed who are now growing cane expressed their intention of increasing their present area, as the Proserpine mill is anxious to get a larger supply from this district. The principal varieties noticed were H.Q.426, 24, 24A, and 24B, and Malagache. Mr. J. Nichol has a number of varieties planted, and amongst them D.1135, 1900 Seedling, 24B, and H.Q.426 look very healthy. Several of the farms have small irrigation plants, and the cane thereon looks extremely well. Liming and green manuring would benefit most of the farms visited.

PROSERPINE.—At Proserpine very heavy rain had been experienced—January 14.96 in., February 15.25 in., March 26.87 in., and April to date 3.16 in., or a total of 60.24 in. This gave the ground a thorough soaking and delayed all farm work. The soil is mostly a dark alluvial, covering a clayey subsoil necessitating surface drainage, and in other places a sandy subsoil is found. Some very good scrub land is found upon the river, and creeks. The various districts are well served with tram lines. Samples of soil taken show the need of drainage and liming in most cases. I am informed that burnt lime at £4 5s. per ton and earth lime at 27s. 6d. per ton delivered at Proserpine can be obtained.

So far very little cane disease has troubled this district. Several tractors are in use, the owners claiming that although very expensive to work lately on account of high cost of fuel yet they are a good investment when large areas have to be prepared. The principal varieties of cane harvested last season with their average c.c.s. are as follow:—

Variety	Average c.c.s.	Proportion of Crop.
H.Q.426 (Clark's Seedling)	15.2	23 per cent.
Malagache	13.2	18 per cent.
Goru	13.6	16 per cent.
Badila	14.4	13 per cent.
S. Singapore	13.1	10 per cent.
D.1135	13.3	8 per cent.
1900 Seedling	14.3	4 per cent.

and 13 other varieties amounting to only a proportion of 8 per cent. of total crop.

Q.1121 and Q.813 together were represented by only 1 per cent. of crop, and they had an average density of 13.1 and 14.3 respectively. A far larger proportion of Q.813 is now, however, being planted as this cane is rapidly increasing in favour.

Grubs were found last year in isolated places and about 5 tons of beetles were paid for early this year by the Farmers' Association. At Strathdickie, Mr. R. Redhead suffered somewhat from grubs in 1920. He then planted a crop of corn and when plowing out same, found numerous grubs about. When planting this with cane he put arsenic to the amount of 80 lb. to the acre in the drills with the plants, and then covered over with soil. The cane (Clark's Seedling) now looks very well. Upon the river bank Ruge Brothers have a very fine crop of 1900 Seedling ratoons. It is a good colour and has stooled out well. A large area of land is now being cleared by the use of 2-horse grubbing machines, supplied to the farmers at a weekly rental by the mill management. The use of these is much appreciated, and judging by present results should very materially aid in a larger area being placed under cultivation in the near future.

With present weather conditions the mill should harvest a tonnage of about 60,000 tons for 1921.

HERBERT RIVER.—The conditions here, too, had been extremely wet, preventing ploughing and cultivating generally. The two mills should approximately cut 220,000 tons. The soil generally is a dark or light coloured alluvial loam, covering clayey and sandy scrub soils. The principal varieties of cane grown are H.Q.426 (Clark's Seedling), N.G.15 (Badila), Gorus, 24, 24A, 24B, Black Innis and 1900 Seedling. The Colonial Sugar Refinery are also now distributing the variety known as H.Q.409. It is said to be a good striker, and a very large stooler, and is of good density. A number of tractors are in the district, but the horse is still doing the greater amount of the work. Owing to the absence of seed very little green manuring has been possible. Liming is increasing in favour everywhere, and when used the crops show up correspondingly. Mr. Glover of Hawkins Creek used about 2½ tons of earth lime to the acre on his first ratoons, and a couple of months later 2 cwt. per acre of blood manure. The cane looks very fine. Mr. Enticknap also used 1 ton to the acre of lime on a 12 acre block of plant cane, this also looks better than his unlimed cane. Also upon the abovementioned block was a small patch of land that repeatedly failed to grow cane, but, after liming, this piece is well up to the average of the block. Grubs are showing up in several parts of the district and may yet do some damage to the growing crops. At Halifax, Mr. Skinner is now carrying out an interesting trial. His farm always suffers very badly from this pest, and so after ploughing in a crop of cow pea and subsequently planting, he used arsenic at the rate of 40 lb. to the acre, running the arsenic mixed with a little lime through a manure distributor, and as close as he could to the cane, covering over with a disc harrow; later on he used a top dressing of about 2 cwt. sulphate of ammonia to the acre. This cane now looks splendid although in a place where grubs always show up early.

Although I have not noticed it, I was informed that borers were in evidence on a few farms. It must be emphasised most strongly that the utmost care should be taken in selecting plants from any of these infested paddocks.

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 4.

YELLOW SASSAFRAS (*Doryphora sassafras*).

Common Names.—Yellow sassafras, Sassafras, New South Wales Sassafras, Golden Deal.

Derivation: Gk. *dory,* a spear; *phoreo,* I carry (alluding, perhaps, to the bristle-like points of the anthers), sassafras is the name of a well-known North American tree with a similar fragrance.

Description.—A large tree attaining a height of 120 ft. and a barrel diameter of 4 ft. Barrel not prominently flanged. Bark grey, sometimes slightly wrinkled and finely scaly; when cut it is brown and measures 7/16 in. thick on a tree with a barrel diameter of 2 ft. 4 in., sapwood pale. Heartwood deep yellow. The bark and sapwood are fragrant, but the sassafras odour of Queensland specimens is not so strong as in *Cinnamomum Oliveri.* Young shoots and flowers downy with silky hairs; adult leaves and branchlets hairless. Leaf stalks ⅛ to ¼ in. long. Leaves opposite, elliptical, narrowed at the base, the apex with a blunt point, margins coarsely toothed, lateral nerves and net veins more conspicuous on the underside; measurement of leaf blade, 1¾ to 3½ in. long; 2½ to 3¼ times as long as broad. Flowers in small bunches in the forks of the leaves. In each flower-bearing fork there are one or two stalks (peduncles), measuring from ⅛ to over ¼ in. long, at the top of which are generally three silky downy flowers each on a stalklet about ¼ in. long. Individual flowers about 1 in. in diameter when expanded. The outer part of the flower consists of six perianth lobes tapering into fine points. On the inside of the perianth lobes and opposite to them are six stamens nearly as long as the perianth lobes; the anthers or pollen-containing organs of the stamens are situated towards the base of the stamens and are surmounted by long bristle-like points; alternating with the stamens are six shorter and narrower staminodia. The carpels, the female organs of the flower, of which there are several, are situated within the lower part of the perianth.

In the fruit the lower part of the perianth is enlarged, becoming narrowly egg-shaped and measuring over ½ in. in length; it eventually splits on one side and exposes the carpels, which are covered with long brown hairs attaining ½ in. in length.

Flowering period, July; in fruit, November and December.

Distribution.—Confined to Australia. A very common tree in the "scrubs" of the ranges near Killarney, Macpherson Range, National Park, and Upper Nerang River. We have no record of it north of Brisbane. It is found in New South Wales in "scrubs" or "brush," from near the Victorian border on the south to the Queensland border on the north.

Uses.—The timber appears to be used fairly extensively in the Warwick district for general indoor purposes, such as lining, flooring, &c. It is often known there as "Golden Deal." In New South Wales it is also used for lining, flooring, &c. According to Mr. J. H. Maiden, it is rarely touched by white ants, but takes a long time to dry and will not stand glueing.

Chemical.—Dr. J. M. Petrie, Linnean Macleay Fellow in Biochemistry, found that the bark, leaves, and fruit contain an essential oil of a characteristic sassafras odour. The bark contained 1.35 per cent., leaves 4.3 per cent., and fruit 4 per cent. (percentage calculated on material dried at 100 deg.). He also found in the bark, leaves, and fruit a poisonous alkaloid which he named "Doryphorine."

References.—Doryphora sassafras *Endlicher,* "Iconographia Generum Plantarum," tablet 10; Bentham, "Flora Australiensis," vol. v., p. 283; F. M. Bailey, "Queensland Flora," part iv., p. 1295; J. H. Maiden, "Forest Flora of N.S.W.," vol. 1, p. 42, with figure.

Photo. by the authors.]

PLATE 6.—YELLOW SASSAFRAS (*Doryphora sassafras*).
Mountain Ranges East of Emu Vale, near Killarney.

PLATE 7.—YELLOW SASSAFRAS (*Doryphora sassafras*).
A.—Flowering shoot. B.—Fruiting shoot

Photo. Dept. Agriculture and Stock.]

Entomology.

THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Although much has been published, both of a scientific and popular character, respecting the cane-grub problem, no attempt has, I believe, been made, up to the present, to describe and at the same time illustrate the metamorphosis and external anatomy of our principal cane-beetle, *Lepidoderma* (*Lepidiota*) *albohirtum*, Waterhouse.

The figures on the accompanying plate were drawn and coloured from nature by the writer. The illustration will enable growers to at once distinguish the various life-cycle stages of this pest from those of other closely related but less injurious root-eating Scarabaeidæ associated with sugar-cane, and also obviate any necessity for lengthy technical descriptions that are often objectionable to the average reader.

THE EGG.

In general appearance the egg is obtusely-ovate, creamy-yellow (fig. A), the chorion or shell somewhat coriaceous, finely and irregularly sculptured on the surface, as shown enlarged in fig. B.

When first deposited it is about 4.25 m.m. long by 2.85 m.m. in width, but during development gradually swells, until just prior to hatching it becomes more rounded, darker, sometimes brownish, and may measure fully 6 m.m. in length (nearly a quarter of an inch).

The depth at which these eggs are found depends, naturally, to a great extent upon the amount of moisture in the soil at the time of deposition, which needs to be sufficient to keep them thoroughly damp during a period of at least two weeks.

Practically all of the female specimens confined by the writer in cages of moist earth 5 in. deep at Gordonvale Laboratory (December, 1916) oviposited against the bottom of their cages, where the earth had purposely been made wetter and firmer than that nearer the surface. Had there been more depth of soil, they would probably have gone down a few inches deeper.

Those laying large batches of eggs usually constructed a chamber of irregular shape, from 1 to 1½ in. in length (fig. A), with sides more or less compacted, sufficient room being allowed for the eggs to expand during development.

This cavity generally contained some loose earth, displaced most likely by the beetle whilst crawling from the spot after having oviposited.

The eggs are placed in a flattened mass on the floor of the chamber, and may be produced separately or attached in short strings of two or more, or in adherent groups consisting of as many as seventeen (so far as observed); but as a general rule they are laid singly, and nearly always intermixed with small particles of soil.

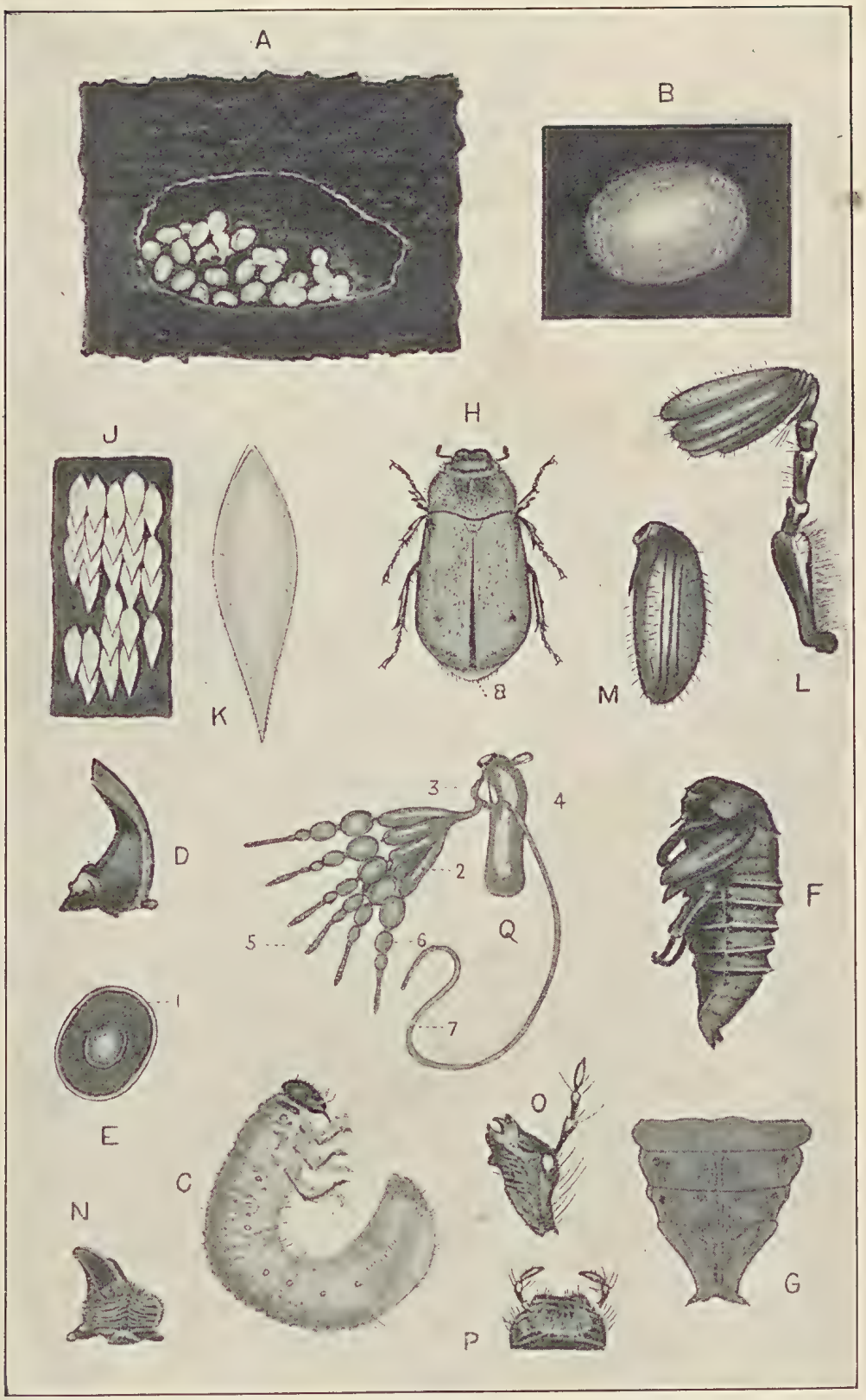
The maximum number derived from one caged female was thirty-six, while other lots, taken from chambers formed in cages of damp earth, comprised eight batches of thirty eggs, three of twenty-nine, one of twenty-eight, one of twenty-seven, seven of twenty-six, three of twenty-five, eight of twenty-four.

The seventy-three females used in the above experiments produced collectively 1,537 eggs (21.5 per insect); but, disregarding specimens laying less than twenty-four eggs, a total of 861 was obtained from thirty-two females, giving an average of about twenty-seven eggs per insect.

When producing twenty or less, the eggs in such lots were generally a little larger at the time of deposition than those taken from chambers containing twenty-five to thirty-six.

Among batches of thirty to thirty-six it was not unusual to find two or three eggs much smaller than the rest.

The two ovaries, one of which is shown in fig. Q, consists of twelve ovarian tubes (Q-2) connected with two oviducts (Q-3), which, together with the long worm-like spermatheca (Q-7), communicate directly with the vagina.



Drawn by Edmund Jarvis.]

PLATE 8.—THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

THE GRUB.

The following brief description of the grub during its third instar (full size) will enable growers to separate it from those of related *scarabaeid* cane beetles.

Description.—General colour creamy-white, bluish, and somewhat translucent just after moulting; the anal segment suffused with dark grey, slatey-blue, or brown, due to the presence and varying colour of the kind of soil ingested. Angular ridges of mandibles black (fig. D); antennæ brownish, five-jointed, the distal ends of same yellow; first joint broadest, about as long as wide; third longest, fourth longer than second, with lower edge of apex produced into a finger-like point; fifth joint about half length of third, with the extremity sub-acute. Stigmata convex, light ochraceous suffused basally with brown, peritreme closed, dark reddish-yellow edged with deeper red, concave, circular near tail end of body (fig. E), and becoming ovate towards head; the spiracle on first thoracic segment largest and usually of irregular oval form. Latero cervical shield light yellow.

Vestiture.—Body clothed with a few rather long light reddish hairs, more plentifully near stigmata and on ventral surface; the ridged elevations of dorsal area of abdominal segments 2 to 6 covered with numerous short very stout brown spines; lower surface of legs thickly clothed with long red spine-like hairs, most abundantly on tibiæ and tarsi; the median path on venter of posterior portion of last abdominal segment consisting of two nearly parallel rows of small stout bristles, about twenty-six on each side, surrounded by longer bristles.[1]

NOTE.—This disposition of the hairs, &c., can be clearly seen with a simple pocket lens, and, being arranged in different order on the anal segments of the various species, affords one of the best means of separating the grubs of our cane beetles.

Greatest size when fully extended, about 2½ in.; in natural doubled-up position, 1 in. Greatest width ½ in., taken across base of anal segment.

The only other large cane-grubs likely to be confused at first sight with that of *albohirtum* are *Lepidiota frenchi*, Blackb.; *L. consobrinus*, Gir.; and *L. caudata*, Blackb.—all of which, however, are slightly darker, decidedly opaque, and have quite different arrangements of the anal path and surrounding bristles.[2]

When a third stage grub of *albohirtum* is first brought to light in the plough-furrow, it displays a rather curious habit of convulsively doubling its head and thorax, for the space of about half a second, against the ventral surface of the anal segment.

If uninjured by the plough, it often repeats this movement at intervals of about ten seconds during the first minute of exposure, before commencing to bury itself again.

THE PUPA.

A popular description of this stage is given by Tryon in his "Grub Pest of Sugar Cane of the Mackay District."[3]

The pupa of *albohirtum* is about the largest of those occurring commonly in the furrows, full size specimens being 1½ in. long by nearly ¾ wide. The general form and colouration are shown in fig. F; but a brief allusion to the chief points of difference between this pupa and those of closely allied species will serve to throw additional light on this phase of its metamorphosis.

The pupæ of several of our scarabæid cane-beetles were classified for the first time in 1916 by Mr. A. P. Dodd, Assistant Entomologist, whose table of the pupæ in Bulletin No. 6 of this Office will be found helpful. In this "key" the pupæ of *albohirtum* is distinguished by the following characters:—"Size large to medium. Cremaster bearing two sharp spines. Clypeus straight or nearly so. Posterior tarsi distinctly shorter than their tibiæ. Outer edge of anterior tibiæ without teeth; spiracles not raised or prominent. Abdominal segments 3 to 6 ventrally with a small triangular transverse slit with serrated margins, the one on the third segment smaller; ridges of abdominal segments 2 to 6 dorsally acute; longitudinal path of irregular striæ on dorsal segments 7 to 9 of abdomen rather broad, narrowed at base, with about 20 fine striæ at its widest part; medio-dorsal line of abdominal segments 1 to 6 plainly visible."

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[1] Bulletin No. 4, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1, fig. 3, 1916 (see anal path of *L. albohirtum*, Water.).

[2] Bulletin No. 6, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1, figs. 17 and 18, p. 5, 1917 (see illustrations of arrangement of bristles on anal paths of *L. frenchi*, Black., and *L. consobrinus* (No. 683), respectively).

[3] Department of Agriculture and Stock, Brisbane, July, 1895.

These striæ, which I have slightly enlarged at fig. G, appear to be a reliable specific distinction. The very noticeable horn-like processes on the cremaster diverge right and left, and are directed upwards and posteriorly at an angle of about 45 degrees.

The lower portion, two-thirds the length of this horn, is dusky-ochraceous, swollen, cylindrical, and slightly tapering, but thence become suddenly contracted, and terminate in a stout black-pointed spine. In some specimens the surface of this tumid basal portion is wrinkled, exhibiting a series of encircling rings.

The pupa of *L. frenchi*, although somewhat resembling that of *albohirtum*, differs in being much smaller (about 1 in. long), and in the possession of three darkly pointed teeth on the edge of the front tibiæ.

With reference to the situation of the pupa of our "grey-back" cockchafer, most growers are aware that the fully developed grub of this species, after tunnelling downwards vertically beneath a cane stool, constructs an oval chamber measuring about 2 in. by 1 in., in which it pupates.

The walls of this chamber are smooth and firmly compacted, being, according to Tryon, specially lined with the food material and ingested earthy matter contained in the hind segments of these grubs.

In order to ascertain the position of pupæ occurring in volcanic land at Gordonvale, tests were made by the writer during October, 1915, by digging a number of pits 5 ft. square by 2 ft. deep. The first four of these holes contained collectively a beetle, four larvæ, and twenty-three pupæ of *albohirtum;* besides thirty-two grubs of other species of Scarabacidæ (principally *L. frenchi*) in various stages of growth. No pupal chambers occurred nearer than 1 ft. from the surface, and none deeper than about 15 in., the majority being in soil that was nearly dry.[4]

The occurrence of pupæ at depths of 4, 5, 5½, 6, 12, and 15 in. was recorded by Girault and Dodd in 1915; the lesser depths (from 4 to 5 in.) having been obtained by them from sandy and sandy-loam soils.[5]

Judging by the above records, one might be inclined to imagine that the position of the pupal chamber may not always be determined by varying degrees of moisture in the ground; but it should be borne in mind that, although the occurrence of pupæ in dry situations is by no means uncommon, satisfactory conclusions in this connection are impossible in the absence of exact knowledge regarding the climatic conditions prevailing at the time when the pupal chamber is under construction.

Such great variation in depth (from 4 to 15 in.) must, I think, be attributed to the combined influence of several factors, such as the temperature, moisture, drainage, and mechanical condition of infested lands, operating in conjunction with other agencies influencing the movements of the mature grub; or possibly to the aggression of certain predaceous insect or other enemies chancing to be present in the soil at a time when grubs happen to be tunnelling below to pupate.

The lining or, in reality, puddling of the cell walls would naturally tend to retard evaporation and to some extent lessen the need for absolute dependence on outside moisture.

Tryon was the first to record the interesting fact that grubs of our "Grey-back" cane-beetle usually pupate directly under the stools they have been destroying. "This," he remarks, "is probably the outcome of an instinct for self-preservation—the dryness of the soil often proving fatal to their existence—and an inherited experience that moisture is retained for a long time perpendicularly beneath the cane stool, when it has vanished in great measure from the earth that surrounds it."

It will be seen from the foregoing notes that the pupa of *albohirtum* occupies a position of complete isolation, lying not only at a greater depth than the eggs, but being placed in a specially prepared chamber, with its smooth walls lined in a manner calculated to effectually exclude small insect enemies, and prevent it from drying up or being harmed by heavy rains. This isolation of the pupa proves advantageous also to the beetles themselves, which often have to remain several weeks, occasionally months, in these subterranean chambers while waiting for rain to soften the ground sufficiently to allow them to tunnel to the surface and enter upon their aerial existence.

THE BEETLE.

Description.—Size and general appearance as shown in fig. H. Deep-brown, almost black, more or less thickly covered, except on legs and central area of venter of abdominal segments, with minute, white, sharply-pointed, pear-shaped scales (figs. J, K); not lying in punctures but exposed and readily detachable.

[4] Queensland Agricultural Journal, vol. iv., pt. 6, p. 350, Dec. 1915.

[5] "The Cane Grubs of Australia," Qld. Bureau Sugar Expt. Stations, Division Entomology, Bulletin No. 2, p. 25, 1915.

Freshly emerged specimens are uniformly grey and mealy-looking, but after a few days on the wing become more or less rubbed, these denuded places appearing as irregular black blotches. The scales on elytra of fresh specimens occur most numerously over an area extending about a quarter of an inch on each side of the suture, the central edge or epipleurum being often nearly naked. The pygidium (H. 8) is large, evenly rounded behind, and uniformly but not densely scaled. A small irregular bare patch is usually present on the apical area of each elytron, these two dark spots (indicated in fig. H) being quite a characteristic feature. Just behind each spot lies a small, obtuse, upward projection of the surface of the wing-case, which from this point slopes rather steeply to its apical edge. The sides of the abdomen are thickly covered with scales, which near the costal edge of the elytra are replaced by a mat of finer yellowish-grey decumbent hairs, that cover also the mesonotum and the entire dorsal surface of the propygidium and fifth abdominal segments. Long red bristly hairs occur more or less thickly on the following portions of the body:—Dorsal hind margin of head; outer edges of clypeus, extending ridge-like on frontal portion of eyes; the trophi (figs. N, O, P); anterior edge of prothorax; front margin and upper half of lateral edges of pronotum; legs; centro-ventral area of mesothorax; and posterior edges of pygidium. The form of the antennæ is shown in fig. L, the club being composed of five plates in the male, four in the female; the fifth plate varying in length, and being in some specimens as long as the other four; in others only half the length or even less. The club of female (fig. M) is generally a trifle shorter and more regularly ovate than in the opposite sex. Outer edge of distal end of front tibia with two large bluntly-pointed teeth, and an almost central smaller rather sharp tooth; inner edge provided with a single very stout blunt spine of about the length of first tarsal joint. Intermediate and hind tibiæ with a central tooth and two stout, blunt, curved spurs at distal extremity.

Details respecting the economy and control of this species do not fall within the scope of the present article, but most of our canegrowers are more or less familiar with the principal habits of the adult "Grey-back" beetle, and have collected thousands of specimens from their feeding-trees.

DESCRIPTION OF PLATE.

(Drawn by the Author.)

A—Eggs of "Grey-back" cane-beetle; *in situ*, nat. size.
B—Egg of same, enlarged.
C—Grub of same, third instar, nat. size.
D—Mandible of grub, enlarged.
E—Stigma of same, enlarged; 1, Peritreme.
F—Pupa of "Grey-back" cane-beetle, nat. size.
G—Dorsal view of abdominal segments 7 to 9 of same, showing arrangement of striæ.
H—*Lepidoderma* (*Lepidiota*) *albohirtum*, Waterh.; male, nat. size.
J—Portion of wing-case of same, showing arrangement of scales, enlarged.
K—A single scale, highly magnified.
L—Antenna of same, showing 5-lamellate club, male.
M—Antennal club of female, with 4 lamellæ, enlarged.
N—Mandible of same, enlarged.
O—Maxilla of same, enlarged.
P—Labrum of same (lower lip), enlarged.
Q—An ovary of same, eight days after copulation; 2, ovarian tube; 3, oviduct; 4, copulatory pouch; 5, terminal chamber; 6, immature egg; 7, spermatheca.

THE CANE GRUB.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

Following the deluge of March and April in the Cairns district, we have had almost constant daily showers, keeping the soil in a state of saturation. While this excessive moisture has improved the appearance of dying cane in grubby fields, it has made it very difficult to keep the young plant crop clean. Cane on the forest land, where there is scarcely an indication of grub injury, is making splendid growth, especially the D1135, which is a variety splendidly adapted to the poorer soils. This

cane, however, is unsatisfactory for the rich scrub lands, for the growth is too rank, and the stalks, being so slender, invariably lodge and root to the ground wherever the joints touch. This we have found to be the result in our experimental plots at Greenhills; hence it will be a very troublesome cane to harvest.

The abnormal weather conditions, moreover, have upset our experiments with arsenic, though the fungus disease has caused a real epidemic again among the grubs, the excessive moisture and cool nights being just the conditions required for perfect development of these lowly organisms.

EFFECT OF FLOODING UPON GRUBS AND SUGAR CANE.

During the excessive rains of 1917 I found many apparently lifeless grubs lying about in the water on the surface of the soil. This appealed to me as a possible method of control, so I made some further observations. Much to my surprise, however, the apparently dead grubs soon revived when taken out of the water. Experimenting, I found that it required several days' submergence to really kill them.

Following upon the recent floods, we again took up this phase of the problem. By using pots of soil with one grub in each, and submerging them, we were able to get definite data. These showed that an overflow of one or two days would only destroy the weaklings, while three or four days would begin to have a vital effect even upon the strong, and none of the grubs could withstand an inundation of five days. These conclusions were further borne out by field observations after the soil dried out so that we could dig in it.

The effects of flooding on the cane, however, were rather disastrous, causing the terminal shoot to rot, probably because of the silt that settles into the soft growing tissues. This results in a growth of the lateral buds, with a loss which may vary from 50 per cent. upward.

GRUB DEVASTATION AND ARSENIC AT GREENHILLS.

The appearance of the cane on this estate is enough to make the strongest heart discouraged. The heavy standover crop, which went flat through the wind during April, is shooting badly at the eyes, so that it will probably deteriorate so much that it will be unfit to mill and hence result in a total loss. The ratoon crops, too, were nipped in the bud, so that they came to nothing. The May, 1920, plant cane, however, though the leaves had mostly dried brown by the action of grubs on the roots, is beginning to recover; new roots are forming, and the terminal shoots are showing green again. This cane, though the stalks were fairly heavy, did not fall much, since it was planted very deeply. It will probably give a fair cut.

There has been much correspondence on the use of arsenic, so I realise how anxiously growers are watching the results of our experiments. I am distressed, therefore, to report that placing the poison in the bottom of the drill with the plants has given no results, no matter what quantity was used, even up to 200 lb. per acre. This may possibly be due to the excessive moisture forcing the grubs to the surface, where they feed on the stalks without getting the poison.

On the other hand, where the arsenic was dusted alongside the young shoots when they were about 12 in. high, in May, 1920, the drills being pretty well filled in, we got results. These were most apparent, however, where the poison had been used at the rate of 200 lb. per acre; cane treated with 100 lb. showed some injury, 80 lb. less, beneficial results being scarcely noticeable where 40 lb. was used. From time to time during the development of the grubs we have removed stools of cane in the various plots to determine the effects of treatment. To review briefly: Examination on 8th February, while the grubs were mostly in the first stage, showed scarcely any difference in the number per stool, whether treated or untreated. On 24th February, however, there was a marked difference, most of the grubs by that time having reached the second or third stage. The first untreated plot that we examined gave fifteen grubs per stool, as has been noted in an earlier report, and there were very evident results in all of the treated plots, most of the larger grubs having been killed by the poison. By 11th March most of the cane in the checks was so badly injured that it fell out of the ground, while the treated plots, particularly the one with 200 lb. arsenic, showed results, though these decreased with the amount of arsenic that had been used. On 11th May we excavated a cubic yard of soil in several plots to determine definitely the effect upon the grubs; in the check plot, where we had found forty-five grubs per stool on 24th February, we were now only able to locate thirteen grubs full grown, and eight of these had been killed by the Metarrhizim fungus; furthermore, powdery green dust was also observed in the soil, where other grubs had disintegrated. Hence this disease had probably destroyed 90 per cent. of them in this check plot; the roots of the plants were entirely eaten away, and even

[*From Bulletin No. 8, Division of Entomology.*]

SKETCH OF GREENHILLS ESTATE.

Grub infestation indicated by degree of shading. White, immune area.
Arrows show direction of prevailing winds.
+++ = Feeding trees of the beetles.
═══ = Roads and headlands.
++++++ = Tramlines.

the stalks gnawed badly. A similar excavation in the plot treated with 200 lb. arsenic disclosed only two large grubs, and these were about a foot away from the drill, where the poison had been applied; the roots in this case were solidly in the ground and almost perfect, being 12 in. or more in length. In the plot treated with 100 lb. arsenic, the results were not so satisfactory; six large grubs were found, one of which had succumbed to the fungus. The roots of the plants, however, were still firmly in the ground, and the cane in fair condition. Since the cane in the plots with less than 100 lb. of arsenic showed little or no improvement over that in the checks, we did not take time to excavate in these.

I think we may conclude from these results that, to be effective, the poison should be placed about the plants near the surface. It is a heavy chemical; hence has a tendency to work downward during cultivation, and with the action of water.

In former years, when the whole of the cultivated ground on the Greenhills Estate was planted to sugar cane, there was a rather well-defined so-called immune area (see sketch); most of the infested fields at that time were along the border, next to the timber, especially on the windward side. Last year, however, for the first time these infested fields (the shaded area on sketch) were thrown out of cultivation. It would appear, now, that this was responsible for the general infestation of the balance of the estate, the beetles being simply compelled to travel further in order to secure suitable conditions for ovipositing.

BEETLE BORER TROUBLESOME.

The publication of the beneficial results from the introduction of parasites of the beetle-borer (*Rhabdocnemis obscura*) at Babinda has brought numerous letters from growers in various parts of the State, some of them even writing from districts outside the range of this pest. The latter, of course, mistook the work of the widely distributed moth borer (*Phragmatiphila truncata*) for it.

Unfortunately, the wet weather has seriously interfered with the continuation of our collection and breeding of the parasites (*Ceromasia sphenophori*), and since I must give up the work before it is completed, let me urge growers, especially in the nearby districts, to make their own arrangements for getting material from Babinda. Since the flies are widely distributed in the whole area south of the mill, especially around Moolaba, it will not be difficult for anyone to secure borer-infested cane, cut up in short lengths, so that it can be put into a bag for shipment. To place this parasitised cane in the borer-infested field, I would advise preparing the soil between the rows, so that each stalk could be covered with about 1 in. of finely pulverised soil. This should be done only in a field which is to stand for two months or more, so as to give the flies a chance to escape, reproduce, and spread into other fields before the cane is cut. Let me also urge, again, the importance of a continuous supply of standing cane in each locality, so that these valuable flies can maintain themselves. Since a generation only requires five weeks, cutting all the cane at one time gives them no chance to find borers; hence the flies naturally die out without being able to reproduce. It is not necessary, however, to leave cane in every field, a small area, every mile or so, is quite sufficient to keep them going in the district. Under normal conditions of harvesting, this need cause no waste, for such cane may be cut late in the season after the other fields have come on again.

THE "FIJI DISEASE" OF SUGAR CANE.

The Bureau of Sugar Experiment Stations has received from the Imperial Bureau of Mycology through the Department of Agriculture, Queensland, the following report of R. J. Haskell, Plant Disease Survey, Washington, D.C.

The name "Fiji Disease" has been applied to this serious malady because it was first reported from the Island of Fiji. Further study of the disease will doubtless lead to a better and more appropriate name.

The disease has been known in Fiji since 1905 at least. Although observed by many people, it has not been thoroughly investigated, and the only published accounts that we have thus far been able to find, by men who have studied the disease first-hand, are those of H. L. Lyon and F. Muir, both of the Hawaiian Sugar Planters' Experiment Station. Their articles are published in the "Hawaiian Planters' Record," a journal that is not widely distributed. An account has also recently been given by Otto A. Reinking ("Diseases of Sugar Cane in the Philippines"—Fiji Disease, "Sugar News," 1: 17-19. Nov. 1920), who used the published matter of Lyon as a basis for his note.

This disease occurs in the Fiji Islands, New Guinea, New South Wales, and has just been discovered in the Island of Mindoro of the Philippine Islands. The disease was found in Fiji by F. Muir in the early part of 1910, and reported on by him ("Ha. Pl. Rec." 3: 197. 1910). It was also reported on from Fiji by H. L. Lyon ("Ha. Pl. Rec." 4: 230-232. 1911), who made a special study of the disease as it occurred in that locality. The disease was reported on from New Guinea by Mr. D. S. North, of the Colonial Sugar Refining Company of Australia, who wrote to Lyon that one of the Sugar Company's men had found the disease to be very prevalent in parts of New Guinea (Lyon, H. L., "Fiji Disease in New Guinea," "Ha. Pl. Rec." 12: 200. 1915) on native cane. In view of this discovery, Lyon expressed the opinion that the original home of the disease was very likely New Guinea, from which place it had spread to Fiji and Australia.

The occurrence of the disease in Australia is indicated by Lyon ("Ha. Pl. Rec." 2: 200. 1915) and has been reported by D. S. North as appearing on experimental plots of New Guinea cane, and by A. H. Haywood ("Agr. Gaz., New So. Wales," Nov. 1920, pp. 773-780) who states that it is now a problem with which growers will have to contend.

The presence of Fiji Disease in Mindoro, Philippine Islands, has been suspected for the last three years. W. H. Weston, of the U.S. Department of Agriculture, in 1919-20 learned of this suspicion from C. W. Hines, of the Bureau of Agriculture at Manilla, and a published note on the possible occurrence of the Fiji disease in Mindoro has appeared in the report of the Pest Control Section of the Bureau of Agriculture ("Phil. Agr. Rev." 12: 93. 1919). During the Christmas vacation (1920-21) Prof. Otto A. Reinking, of the College of Agriculture at Los Banos, went to Mindoro and found the Fiji Disease there doing great damage. According to one of the planters, it was present on the island as early as 1916. Prof. H. A. Lee, of the Bureau of Agriculture at Manilla, reports that Mr. Medalla, his assistant, also visited the island and returned with specimens of the Fiji Disease. Letters from both Reinking and Lee, telling of the discovery, reached Washington at the same time. These are the first authentic reports by pathologists of the presence of the Fiji Disease in the Philippines. Just how widely the disease occurs in the Philippines will have to be determined, but it probably does not occur in Negros, the most important cane-producing island.

IMPORTANCE OF THE DISEASE.

Regarding the seriousness of this trouble, F. Muir ("Ha. Pl. Rec." 2: 197. 1910) writes as follows:—"The worst disease in the Fijian canefields is one known as Fiji Disease. . . . This disease has spread over the whole island, but is worst on the northern side, especially on rich soils. This disease is strongly hereditary; when the stool looks perfectly healthy and the galls are seen only on one stalk, and in very small numbers, every stalk from that root will produce diseased cane if used as seed." Again, H. L. Lyon ("A New Cane Disease Now Epidemic in Fiji" "Ha. Pl. Rec." 2: 205. 1910) writes: "It is certain that the Fiji Disease is one of the most serious diseases yet recorded on sugar cane."

The report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association, 14th October 1911, says ("Ha. Pl. Rec." 5: 323, 1911):—"Dr. Lyon's researches say that the so-called Fiji Disease is the most to be dreaded of all known maladies of the sugar cane." In Mr. Reinking's letter he says:—"The disease is one of the most destructive plant diseases that I have ever observed in the Philippine Islands." In view of the above quotations, and also from other reports on the importance of this disease, it seems that this is one of the most serious of sugar-cane diseases, and one to be feared in sugar areas where the disease does not now occur.

SYMPTOMS.

Mr. F. Muir (l.c.) states that the most constant symptom of the disease, as pointed out to him by Mr. North, of the Sugar Refining Company, is the presence of small galls on the undersides of the leaves and in the softer tissues of the cane tops, sometimes extending a long way down the stalk. A more noticeable character is the dying of the tops and the growth of lateral branches, the tops of which also sometimes die, and, in turn, give off lateral growths.

H. L. Lyon (''Ha. Pl. Rec.'' 4: 300. 1911) describes the disease as follows:— ''The most conspicuous symptom of Fiji Disease to be noted in the field is the shortening and crumpling of the last leaves to unfold from the spindle. This peculiarity will attract the attention when one is still a considerable distance from the affected cane. The shoot may have attained considerable length and be clothed with many healthy-looking leaves of the usual length and colour, but all of a sudden it loses the power to produce normal leaves, throws out a few bent and twisted stems, and then ceases to grow altogether. Some of the eyes may start, but the resulting 'lalas' soon repeat the antics of the main stem. The stalk may remain alive for months, or it may die soon.'' He also mentions the characteristic galls usually to be found on most of the healthy-looking leaves and on all of the deformed and blighted ones. The appearance of these galls is the first outward symptom by which the disease may be detected, but the cane may be infected for months before any galls appear. In other words, the galls mark a well-advanced stage of the disease. According to Lyon's photographs, affected plants are very much stunted and dwarfed and die early.

CAUSE.

The Fiji Disease is apparently caused by a Myxomycete somewhat similar to *Plasmodiophora brassicae*, the cause of the club root of cabbage. A study of the etiology of the disease was made by H. L. Lyon, and a preliminary report given out by him (''Ha. Pl. Rec.'' 3: 200-205. 1910). Lyon found what appeared to be the plasmodium of an organism in the cells of the leaf galls, but apparently has not proved the pathogenicity of such organism. He thinks that the swarm spores may gain entrance to the cane tissue by penetrating the roots and then following up the vascular bundles to the leaves. He also thinks that the organism can live over in the the soil for a considerable length of time, as does the organism of club root of cabbage. Plants grown from cuttings taken from diseased cane are sure to be infected. The organism is also readily carried from field to field by the transfer of bits of trash.

VARIETAL SUSCEPTIBILITY.

According to Lyon and Muir the disease shows marked differences in varietal susceptibility in Fiji and New Guinea. On account of this fact, and because of the danger of the appearance of the disease in Hawaii, the Hawaiian Sugar Planters' Experiment Station sent a large number of cuttings of various Hawaiian varieties to Fiji to be propagated there, and to ascertain their relative resistance to the Fiji disease.

AUGUST SHOW DATES.

Lower Burdekin P.A.I.A., Ayr: 5th and 6th August.
National A.I.A., Brisbane: 8th to 13th August.
Bowen P.A.M.A., Bowen: 10th and 11th August.
Belmont A.H.I.S., Belmont: 20th ugust.
Horticultural Society of Queensland, Brisbane: 20th August.
Herbert River P.A.A., Ingham: 26th and 27th August.
Balmoral District H.I.S., Balmoral: 27th August.

ACKNOWLEDGMENT.

In the June Journal, p. 247, we reproduced a plate depicting a new parasite on sheep maggot flies to illustrate Professor T. Harvey Johnston's paper on ''The Sheep Maggot Fly Problem in Queensland.'' The plate was taken from an article in a previous issue of this Journal by Mr. Walter W. Froggatt, F.L.S., Government Entomologist of N.S.W., and to whom we are indebted.

General Notes.

DESTRUCTION OF PRICKLY-PEAR BY MEANS OF ARSENICAL POISON.

By J. C. BRUNNICH, Chemist to the Department of Agriculture and Stock.

Scattered plants of prickly-pear are best destroyed by *injecting* the poison. This may be done by means of any of the powder or liquid injectors, or by making a longitudinal incision in the second or third "leaf" of the plant and placing therein either about a teaspoonful of the dry powder (*a*), or a wineglassful of the concentrated solution of the poison (*b*).

With small plants one injection is generally sufficient, but with larger plants two or more "leaves" may have to be treated.

Large clumps of pear consisting of many plants, and denser pear generally, may be more economically destroyed by first lightly *spraying* with the diluted spraying solution (*c*), then mutilating or slashing the pear with billhooks, spudbars, or any suitable mechanical contrivance, and then again spraying.

In any case it is advisable to burn off the poisoned pear as soon as it has become dry enough to burn readily, as this operation destroys most of the young growth of seedlings, &c., which is usually found under the clumps, and which is often not destroyed by the poison.

The mixtures are prepared as follows:—

(*a*) DRY POWDER FOR INJECTION.

Take—

Fifteen (15) pounds of common salt,

Ten (10) pounds of arsenic,

Four (4) pounds of caustic soda,

and mix these ingredients thoroughly. All the ingredients should be in powder. The mixture must be kept in air-tight tins or packages, otherwise it absorbs moisture from the air, and is inclined to set into a hard lump.

(*b*) CONCENTRATED SOLUTION FOR INJECTION.

The mxture of the dry powder (*a*) consisting of 15 lb. of common salt, 10 lb. of arsenic, and 4 lb. of caustic soda, is placed in a suitable vessel, and to it is added slowly and carefully, with constant stirring, cold water until the total volume is eight (8) gallons.

Should it be found that all the arsenic has not dissolved (which is shown by the fact that it appears as a sediment on the bottom of the vessel), it will be necessary to boil the mixture for a few minutes.

Certain brands of arsenic are more readily soluble than others, and we found "Red Rose" arsenic to be the most readily soluble of many tested.

(*c*) DILUTED SOLUTION FOR SPRAYING.

To eight (8) gallons of the concentrate (*b*) add cold water until the total volume of the solution is one hundred (100) gallons.

This strength of solution is the weakest which can be used economically for spraying, and at certain seasons it may be necessary to use the spraying solution somewhat stronger.

The addition of saltpetre, copper sulphate, or other compounds to the spraying liquid cannot be recommended. They are either useless or worse than useless.

On account of the highly poisonous nature of all arsenical compounds, great care must be taken in the preparation of the solutions, and, particularly, the vapours of the boiling solutions and the spray-laden atmosphere (when spraying) should never be inhaled. To prevent possible absorption of the poison through the skin, it is advisable always to rub vaseline or other grease on the hands and arms before commencing operations. There is, however, little danger if reasonable care is exercised.

Cattle must be kept off country on which pear is being poisoned either by spraying or by injection. The grass will generally grow again after a few weeks in favourable seasons, and cattle may then be allowed to graze with safety on the treated area.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom). In the May number R. C. Punnett, F.R.S. (Professor of Genetics, University of Cambridge) continues an interesting review of results of research in animal breeding, and discusses further simple Mendelian inheritance in respect to coat colours in cattle. "Pollination in Fruits" is another leading feature. Another phase of agricultural education is covered by a paper on "Rural Bias" in Secondary Schools, which, incidentally, describes the work at Sexey's Foundation School in Somerset. "It does not," says the author, "require any special gift of vision to see in secondary schools with a 'rural bias' a prospect that may go far to change the outlook of those who work on the land. . . . It is admitted on all sides that no class of our population has done better work for the country or has received less return for it in years past than the agricultural labourer."

The Journal of Agricultural Research (U.S.A.) for April contains a very informative leading article on "Observations on the Body Temperature of Dry Cows."

The Agricultural Gazette of Canada (March-April) has among its leading topics a survey of "The Financial Benefit of the Work of the Department of Agriculture." A paper on "Marketing and Distribution of Fruit" contains a plea for closer co-operation and co-ordination among growers. Agricultural education in secondary schools is also discussed.

The International Review of the Science and Practice of Agriculture (Rome) for February covers much general agricultural intelligence. An original article on "The Rearing of Donkeys and Their Crosses with Horses in Italy and her Colonies" by Professor Mascheroni (Royal Higher School of Veterinary Medicine, Turin) is of special interest to stock breeders.

The Agricultural Journal of India (March) has an interesting note on "Prickly Pear as Fodder for Milch Cattle," containing the information that in India prickly-pear is used as cattle food during famine periods. "The cactus is roasted over a village forge and chopped fine before being given to the cattle in combination with *kaabi* (dry sorghum stalks) or cotton seed. . . . In reviewing the work Lieut. Col. G. K. Walker, Superintendent, Civil Veterinary Department, Bombay, remarked that 'there can be no doubt that cattle can be maintained on prickly-pear, when necessary, without harm.' It, however, appears from the following extract from the Journal of the Department of Agriculture, Union of South Africa (Vol. 1, No. 9), that prickly-pear is not merely an emergency fodder, but is considered a valuable foodstuff for milch cattle, which increases 'the quantity while maintaining the quality of the milk.' In Corsica and Sardinia a daily ration of about 50 or 60 lb. per cow, comprising prickly-pear finely cut up, mixed with bran or dry grass, was fed to impoverished cows, which had almost ceased their supplies, with good results. . . . In Mexico, milch cows maintained their yields, in spite of increasing coldness of season, when fed on prickly-pear."

The Rhodesia Agricultural Journal (April) features a lengthy report on "The Citrus Industry of California," which strongly emphasises the now generally accepted necessity of growers marketing a standard commercial article, keeping to a standard pack of consistently good quality; and sets out the essentials of success in this highly specialised branch of agriculture as (1) the production of the right class of fruit, (2) close attention to trees, (3) the use of every precaution known to be of value in picking, packing, railing, and shipping, (4) quick action at the right moment at the business end of operations, and (5) advertising propaganda.

Agricultural Gazette of New South Wales (June) contains full particulars of the remarkable milk and butter record of Melba XV. of Darbalara, a deep red, well-framed cow, showing good constitution and of the Milking Shorthorn type. Her official record for 365 days is: Milk produced, 21,635.5 lb.; butter fat, 954.472 lb.; estimated quantity of commercial butter, 1,149.966 lb.

Answers to Correspondents.

SISAL HEMP.

"J. A. C." (Beerburrum).—Your letter was referred to the authority named by you, who advises that it would be unwise, under existing marketing conditions, to devote any time to the culture of sisal hemp.

SEVILLE ORANGES.

J. T. ROWTHAN (Milton).—Your citrus samples are ordinary good commercial Sevilles suitable for preserving purposes. Their skins are bright and very clean. The land on which they were grown—sandy loam naturally drained (Park Ridge, Kingston)—is, according to your description, well suited for citrus culture.

CAROB AND ALGAROBA BEANS.

A Toowoomba correspondent notifies us that seeds of the carob or locust (*Ceratonia siliqua*) may be obtained from the Curator, Botanic Gardens, Toowoomba, where an old tree of this species bears fairly freely. The seed germinates readily if soaked in water for about a day before sowing. Our correspondent raised a few seedlings from this tree last year.

Another correspondent—W. Brotherton, of "Brotherton," Gladstone—states that his Algaroba tree shed all its pods in May, and at the time of writing (6th June) was a mass of blossoms. It is a *Prosopis juliflora*. He is willing to supply seeds at a nominal price to cover incidental cost.

RATS, MATCHES, AND FIRES.

W. A. NOBLE, Toowoomba, writes:—"Being especially interested in the subject of rats and matches now under discussion in your Journal, may I give my experience? Some time since, my buggy was brought into the coach-house during the evening and, inadvertently, a box of wax matches was left on the leather-covered cushion. In the morning I found the box lid had been nibbled through and the charred remains of the box and a number of burnt matches lying on the cushion which was also charred to the extent of about a 3-in. circle. Lying on the floor of the buggy also were several matches that had been nibbled but not ignited. The fact that in the building were bags of maize, also bran and pollard, proves to my mind that rats do chew matches and are very fond of them when accessible. Since the discovery I have not allowed wax matches into my house unless when kept in tin boxes."

TO PICKLE OLIVES.

INQUIRER (Bulimba).—Make a brine with coarse salt and a small piece of saltpetre (the size of a nut) of strength sufficient to float an egg. Place the olives selected, half ripe or ripe of full colour, in a jar. Pour in the brine to cover olives, keep them entirely immersed in the solution, and let them stand for from 4 to 6 weeks. Then pour off brine and replace with half strength solution for about 2 weeks, and then with quarter strength for, say, a similar period. Wash before serving.

Another method:—Select half ripened or full ripened olives. Wash and place in jar (glass for preference) in layers covered by coarse salt. The olives may be pricked with a needle beforehand. When jar is filled with alternate layers of fruit and salt, top with salt and let stand until it liquefies and becomes wine coloured. This takes from 3 to 4 weeks. Then wash olives and replace in weak brine or water, and let stand until required for table. Wash before serving.

Another recipe:—Pick olives when turning from green to ripened colour, though ripe fruit may also be used. Cover for the first time with a solution containing 2 oz. caustic soda and 3 oz. salt to each gallon of water, and allow to stand for 24 hours. Then change solution to 3 oz. salt to 1 gallon of water for 24 hours. Then, in order, 4, 5, 6, and 8 oz. to gallon, keeping each solution in use for 48 hours or longer. After the last immersion, pickling is complete. Olives must be kept entirely immersed at all times.

The Markets.

PRODUCTION AND MARKETS.

The following survey is an abridgment of weekly departmental summaries of conditions, prospects, and prices (21-6-21).

AGRICULTURE.

Early in June, fairly widely distributed rainfalls were reported from the Southern Coastal districts. The Downs also reported good falls. Goondiwindi had 2¼ inches, and Allora, Inglewood, and Dalby each over 1 inch. Several other registrations, ranging from 20 to 90 points, were reported. Only light precipitation was recorded in the Lockyer; Laidley with 86 points being the most fortunate. The Boonah district had only 55 points for the first week of the month. Light frosts were reported in some localities.

The formation of a Canary Seed Pool is expected to generate a more active spirit of co-operation among growers.

Good accounts of the new maize harvester, invented by Mr. George Free, of Nobby, which is capable of harvesting, threshing, and bagging maize direct from the standing crop, continue to be received.

Heavy supplies of maize had the effect of keeping prices reduced. Lucerne and oaten chaff was plentiful, but the demand was light. Potatoes were marketed in large quantities to an improved demand. Broom millet was not plentiful, and production generally appears to be light this season. The price of prime hurl remained at the same figure; other qualities declined £2 per ton.

In the second week of June exceptionally heavy rains were almost State wide in precipitation. All the Southern Queensland agricultural areas were favoured, floods occurring in many localities. Many of the farms on the Barambah Creek frontages in the Murgon district (South Burnett) were more or less inundated, a considerable crop loss resulting. Heavy losses of maize and potatoes were reported. The North Coast district, where previously heavy rains had fallen, suffered much in this respect. Part of the Goondiwindi country was flooded, but, owing to dry conditions previously prevailing, not much wheat had been planted, otherwise crop losses would have been more serious.

In many districts, particularly the Lockyer, Downs, and Boonah regions, the winter rains proved timely and of immense benefit. The general seasonal outlook is most promising. The season to date has been very mild in temperature, and should the localities which have been eaten bare escape frosts for the next few weeks, young grass and herbage will make good headway. Deliveries of cotton continue at the departmental ginnery, Brisbane, which is in active operation. Maize supplies were light, probably due to the heavy conditions of country roads. Potatoes sold to 6s. 6d., with supplies plentiful and demand fair. Lucerne chaff was plentiful and topped at 10s. 6d. Supplies of oaten chaff were fair. Pumpkins and sweet potatoes were fairly plentiful. Only one line of barley was offered. Brown Millet supplies improved. Prime hurl sold to £26.

For the week ended 21st June, the weather was fine generally. Scattered showers were reported. The heavy rains of the previous week were generally most beneficial, and reports from agricultural and pastoral areas were most encouraging. Maize supplies were light, but improved as the week advanced. The price, 4s. 1d., was better. Lucerne chaff came forward heavily and sold to 9s. Oaten chaff consignments were fair. Potatoes were plentiful. Most of the pumpkin lines were passed in. No sales of skinless barley were made.

DAIRYING.

Production is shrinking gradually, in keeping with seasonal conditions.

For three weeks ended 21st June, 26,934 boxes of butter (each 56 lb.) and 137 crates of cheese (each 142 lb.) were graded. Dairy produce in cold store (18-6-21) was 16,193 boxes butter and 43 crates cheese. 14,886 boxes butter were shipped oversea, and 14,846 boxes butter and 20 crates cheese were shipped interstate.

FRUIT AND VEGETABLES.

Mild spring-like conditions produced a heavy growth of vegetables. Strawberries are yielding very heavily. Pineapples and bananas continued to make growth, and excellent pines reached the market. Southern prices for bananas were very satisfac-

tory. Citrus fruits came forward in much better quality, and practically free from fly. The heavy mid-month downpour proved most beneficial, soil and subsoil receiving a thorough soaking. The rain, accompanied by warm weather for the time of the year, has produced very vigorous growth in all crops. The good growing conditions favoured the development of Irish blight, and tomatoes were somewhat affected. Mango trees in blossom in the Brisbane district show evidence of extraordinary seasonal mildness. If the blossom sets, an exceptionally early crop may be expected. Pawpaws are ripening fast, and custard apples are in good supply.

FAT STOCK.

Prime bullock beef realised from 20s. to 30s., and cow beef from 15s. to 27s. Prime mutton reached 4½d.; good trade mutton ranged from 2¾d. to 4d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MAY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1921.	May, 1920.		May.	No. of Years' Records.	May, 1921	May, 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	2·22	20	2·53	2·84	Nambour	5·15	25	3·78	2·69
Cairns	4·71	39	6·50	11·78	Nanango	1·67	39	1·31	1·82
Cardwell	3·78	49	6·51	11·36	Rockhampton ...	1·64	34	1·25	1·94
Cooktown	3·20	45	2·18	12·68	Woodford	3·07	34	2·34	3·80
Herberton	1·76	34	2·92	4·62					
Ingham	3·75	29	4·20	12·07					
Innisfail	12·98	40	16·87	29·58					
Mossman	3·39	13	5·41	15·56					
Townsville	1·42	50	2·05	5·27	*Darling Downs.*				
					Dalby	1·37	51	1·96	1·95
Central Coast.					Emu Vale	1·28	25	0·98	2·32
					Jimbour	1·26	33	1·47	1·57
Ayr	1·27	34	1·45	5·57	Miles	1·62	36	1·31	0·52
Bowen	1·41	50	0·99	4·48	Stanthorpe ...	1·99	48	3·05	2·20
Charters Towers ...	0·85	39	1·30	3·34	Toowoomba ...	2·38	49	1·23	3·48
Mackay	4·05	50	1·41	7·47	Warwick	1·69	34	0·88	2·19
Proserpine	5·45	18	5·44	7·89					
St. Lawrence ...	1·93	50	1·61	4·19					
					Maranoa.				
South Coast.									
					Roma	1·52	47	0·59	0·35
Biggenden	1·92	22	2·73	1·39					
Bundaberg	2·84	38	2·04	3·01	*State Farms, &c.*				
Brisbane	2·89	70	0·76	2·02					
Childers	2·41	26	2·62	2·89	Bungeworgorai ...	0·78	7	0·53	0·95
Crohamhurst ...	5·00	25	3·91	5·18	Gatton College ...	1·95	22	1·17	3·26
Esk	2·20	34	0·92	2·41	Gindie	1·13	22	1·44	0·57
Gayndah	1·61	50	2·63	1·86	Hermitage ...	1·45	15	1·06	2·44
Gympie	3·10	51	1·59	1·79	Kairi	2·35	7	3·50	3·76
Glasshouse M'tains	3·86	13	...	3·26	Sugar Experiment Station, Mackay	3·81	24	1·76	7·87
Kilkivan	2·02	42	1·18	2·41	Warren	1·46	7	0·94	4·61
Maryborough ...	3·17	50	1·96	3·61					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good, sound seed that has sprouted. Preventive measures should be taken to spray young and growing crops to check Irish blight, using "Bordeaux" or "Burgundy" mixtures. Full particulars on this subject are obtainable on application to the Department of Agriculture. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop.

Sow pumpkins. Swede turnips and lucerne may still be sown in temperate districts, but they will have to contend with weeds which will begin to vigorously assert themselves as the weather gets warmer; therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case also it is advisable to avoid too frequent planting of cuttings from the old vines, and to obtain cuttings from other districts or raise "shoots" n a hotbed from tubers selected from heavy yielding plants. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn out sugar lands in the Central and Northern districts if not intended to be manured and replanted will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Orange-trees will be in blossom, and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

August is to be regarded as a period for activity in all matters appertaining to cultivation.

In the coastal districts plant life becomes active earlier than in other and more temperate parts of the State, consequently judgment should be used in respect to the planting and sowing of seasonable crops in keeping with local conditions. Vegetable growers in favoured localities should make every effort to cater for the early market trade and endeavour to obtain enhanced prices for their produce. Succession sowings are advisable to keep up a continuity of supplies throughout the season. Special attention should be paid, however, to the spraying of crops to check the insidious attacks of insects, which are more prevalent in mild seasons like the present one.

Success in all matters connected with crop production depends largely on the thorough preparation and manuring or fertilising of the land beforehand to bring it into the best possible tilth for planting. This is very necessary when artificial supplies of water are limited.

Crops of all kinds which establish themselves in the cooler part of the season and have the opportunity of developing a good root system will produce in greater abundance.

Mulching, by means of well-rotted farmyard manure, will do much towards the retention of moisture in the soil, by checking evaporation. Where supplies are not available, the constant stirring and movement of the surface soil by cultivation may be substituted.

Orchard Notes for August.

THE COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of Citrus Fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where Winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, pawpaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. Just as the buds of the vine begin to swell, but before they burst, all varieties should be dressed with the sulphuric acid solution—viz., three-quarters of a pint of commercial sulphuric

acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid. This is the winter treatment for the prevention of anthracnose or black spot, and for downy mildew, and should on no account be neglected.

Fruit-fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit-flies early in the season is the surest way of checking this serious pest.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the granite belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear, or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphis, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphis should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the warmer parts of these districts the pruning of grape vines should be completed, and they should receive their winter dressing for black spot and downy mildew, as recommended for the coast. In the granite belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

SUSPECTED POISON WEED IDENTIFIED.

A specimen forwarded by the Prisons Department is identified by Mr. C. T. White, F.L.S., Government Botanist, as *Stachys Arvensis*, a weed variously known as Stagger Weed, Sweet Nettle, Hedge Nettle, Wild Mint, &c.

It is one of those plants about which there is some doubt as to its qualities. It is looked upon almost universally by stockmen in Australia as a plant causing "shivers" or "staggers" in horses, working bullocks, and travelling stock, but is almost or quite harmless to resting stock such as milking cows and calves. This is very remarkable, as the weed is common in Europe and America, but no bad reports are heard of it from those countries.

However, quite recently a closely allied plant (*Lamium amplexicaule*) has been shown to be able to produce "staggers" or "shivers" in travelling or working stock, so it is more than likely that the popular belief regarding *Stachys Arvensis* is founded on fact.

Stock suffering from shivers or staggers usually recover if rested and taken off paddocks containing the plant responsible for the mischief.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.
AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6 39	5·3	6 30	5·18
2	6·14	5·16	6·31	5 0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6 39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5 20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5·6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6 22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5 9	6·19	5·25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6 37	5 0	6·37	5·10	6·17	5·26
18	6·23	5·5	6·37	5 0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5 0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5 1	6·34	5·14	6·10	5 29
26	6·28	5·2	6·39	5·2	6·34	5·15	6 9	5·30
27	6 28	5·1	6·39	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6 39	5·2	6 33	5·16	6·7	5·31
29	6·29	5·1	6·39	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6 39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
8 May.	●	New Moon	7	2	a.m.
15 „	☾	First Quarter	1	25	a.m.
22 „	○	Full Moon	6	15	a.m.
30 „	☽	Last Quarter	7	45	a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4	14	p.m.
13 „	☾	First Quarter	7	0	a.m.
20 „	○	Full Moon	7	41	p.m.
28 „	☽	Last Quarter	11	17	p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11	36	p.m.
12 „	☾	First Quarter	2	16	p.m.
20 „	○	Full Moon	10	8	a.m.
28 „	☽	Last Quarter	12	20	p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6	17	a.m.
11 „	☾	First Quarter	12	14	a.m.
19 „	○	Full Moon	1	28	a.m.
26 „	☽	Last Quarter	10	51	p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

BIOLOGICAL CONTROL OF THE PRICKLY-PEAR PEST.

BY PROFESSOR T. HARVEY JOHNSTON, Scientific Controller, Commonwealth Prickly-pear Investigations.

It was stated a few years ago that the estimated area of prickly-pear infested land in Eastern Australia was over 22,000,000 acres, about 20,000,000 being in this State and the remainder in New South Wales. It was pointed out that this area was one-third more than the total area under crops (including fruits of all kinds) in the whole of Australia, and that this immense total was being increased at the rate of about 1,000,000 acres annually in Queensland alone.(1)

Attempts have been made to control the pest by legislation; by mechanical methods; by chemical means; and, to a very slight extent, by biological agencies. Of these, the most effective, so far, has been the chemical method, which has been thoroughly tested in this State, especially by Mr. Brünnich and Dr. White-Haney.(2) It is known that certain combinations of arsenic are highly poisonous when applied in the form of a gas or vapour, as injections, or as sprays; but the cost of labour and material is commonly too great for these chemical methods to be economical, since the expense incurred in clearing infested land is very frequently greater than the value of such land when cleared. Even if an area be once freed from prickly-pear by such means, a considerable amount of time and money must be expended each year if such land is to be preserved from fresh infestation.

The biological method of attacking the problem, which has not yet been given a fair trial, necessitates a study of the plants themselves, and especially of the various natural enemies known to infest prickly-pear and other cactus plants in various parts of the world. Many such enemies are now known to occur, some of them being insects; others are fungi, and others are bacteria. Amongst the insects are included several kinds of moths which in their caterpillar stage bore into and feed upon the plant tissues; certain beetles, such as the cactus longicorns and weevils; cactus bugs

(1) "The Prickly Pear in Australia," by W. B. Alexander. Bulletin 12, Institute of Science and Industry, 1919.

(2) "Reports of the Prickly Pear Experimental Station, Dulacca," by Dr. Jean White-Haney—In Ann. Reports, Dept. Lands, Queensland, for 1912, 1913, 1914, 1915.

and the various forms of cochineal insects; sundry species of flies, including the cactus midges and many kinds of scavengers whose larvæ live in and assist in destroying injured and diseased plant tissues.

The Queensland Government in 1912 appointed a Travelling Commission, consisting of Mr. Henry Tryon (Government Entomologist) and the writer, to visit various countries of the world, in which prickly-pear plants occur either indigenously or in a naturalised state, in order to study the possibility of utilising biological means for the subjugation of the pest. As a result of its inquiry, the Commission recommended that certain of these enemies, known to be restricted to cactaceous plants, should be introduced, and their efficacy tested in Australia.(3)

Certain of these were actually sent or brought from abroad by the Commission, viz.:—the true cochineal, *Coccus cacti* (*Dactylopius coccus*), and one kind of wild cochineal, *Coccus capensis*, both from Cape Colony; another kind of wild cochineal, *Coccus indicus*, from Ceylon and from Northern India; a moth borer, *Zophodia cactorum*, from the Argentine Republic; and a fungus disease, "Shot hole" or Anthracnose, caused by *Glœosporium lunatum*. Only two of these agents became established in Queensland—viz., *Coccus indicus* and *Coccus capensis* (4)—both of which, unfortunately, restrict their attentions to one kind of prickly-pear, *Opuntia monacantha*, the attack by *C. indicus* being particularly injurious to that plant. In fact, the introduction of this insect has been so successful that the "*Monacantha*" pear has been practically eliminated in all districts where the wild cochineal has been able to obtain access to it. Instead of adapting itself to other kinds of cactaceous plants naturalised in Queensland, the organism, after destroying its favourite food-plant, dies. As this particular kind of insect attacks a species of prickly-pear native to certain parts of South America, Southern Brazil, and the adjacent parts of Argentine and Uruguay, and does not infest any of the other species naturalised in our continent—species whose original homes are Mexico, West Indies, and the neighbouring coasts of U.S.A.—it is reasonable to assume that the native home of the insect may be some South American locality. In fact, one species has been described under the name of *Coccus argentinus*, from the Argentine, where the writer has seen it infesting various species of cacti. It is not unlikely that the two names may be synonymous. It is known in animal parasitology that when a host animal and its parasite are imperfectly adapted to each other the latter may sometimes produce effects so virulent as to destroy the host, whereas related parasites may cause comparatively little inconvenience. It is, then, possible that *Coccus indicus* may not be a normal parasite of *Opuntia monacantha*, but may infest some other South American species of prickly-pears and cause much less damage than that noted as having been brought about in India, Ceylon, South Africa and Queensland by the attacks of this insect on "*monacantha*" pear.

The success which attended this introduction led the Commonwealth Institute of Science and Industry to approach the Governments of the Commonwealth, New South Wales and Queensland with a request that funds be set aside to allow the other biological recommendations of the Travelling Commission to be tested in accordance with a scheme of investigation drawn up by the Institute. The war hindered the progress of negotiations, but eventually co-operation was secured, and the writer was asked to undertake control of the scientific side of the investigation.

The scheme came into operation officially in June, 1920; and a visit was made to North and South America, assistants selected for the work in those two continents, and all arrangements made in regard to laboratory accommodation and assistance in the various centres proposed to be explored, as well as for the collection and transit of desired material, &c.

Some natural enemies were brought across from South America by the writer, the chief being two disease-producing fungi (*Sclerotinia cactaccarum*, *Montagnella opuntiarum*), and a certain species of Syrphid fly which breeds in great numbers in injured or diseased prickly-pear joints and brings about their rapid destruction. Unfortunately, the flies which bred out readily from the larvæ that were imported, failed to breed, and, having now all died, the introduction has not led to their establishment in this continent. The fungi are being experimented with under laboratory conditions. Both of them are very important prickly-pear destroyers in Argentina, from the Andes to the Atlantic Coast.

Recently a consignment of cactus insects and disease-producing germs (both fungoid and bacterial) arrived from Southern Florida and Texas, chiefly from the former locality, where they were collected or bred by one of the writer's staff (Mr. J. C. Hamlin). Included in the collection were the following organisms:—(1)

(3) "Report of the Prickly Pear Travelling Commission, 1912-1914," by T. Harvey Johnston and Henry Tryon. Parliamentary Report, 1914.

(4) Dr. White-Haney, *l.c.*, 1914 (1915) and 1915 (1916). T. H. Johnston, Proc. Royal Soc. Queensland, 1916, pages 22-25.

Cactus moth-borers (*Melitara prodenialis*); (2) cactus weevils (*Gerstæckeria hubbardi, G. nobilis, G. porosa, G. clathrata, G. basalis,* the first from Florida and the remaining species from Texas); (3) cactus bugs (*Chelinidea vittigera* from Texas, *Chelinidea* sp. from Florida); (4) wild cochineal insects, one or two kinds from Florida and Texas); (5) three or four different kinds of scavenging flies which breed in injured pear (*Volucella esuriens, V. fasciata, Copestylum marginatum,* and a large dark-coloured species of *Hermetia*); (6) four different kinds of fungi (*Glœosporium lunatum, Hendersonia opuntiæ, Phoma* sp., and *Perisporium Wrightii*); (7) a bacterial rot.

From some of the fungi and from the rot pure cultures have now been isolated in our laboratory in Brisbane, and are being subjected to experiment. Subsequently a number of pure cultures of three fungi (*Glœosporium lunatum, G. cactorium,* and *Hendersonia opuntiæ*) have been prepared and forwarded by Dr. Berger from Florida.

A consignment of material collected in Argentina by another member of the staff (Mr. W. B. Alexander), is now in Australian waters, and should reach Brisbane shortly. In addition to *Zophodia,* it contains the Argentina cochineal, as well as the fungi *Montagnella* and *Sclerotinia,* referred to above.

There is also in the laboratory some of the wild cochineal, *Coccus tomentosus* (apparently the same as the Texan form recently received), forwarded by Dr. Griffiths from Chico, California, to Mr. A. T. Clerk, and by him handed over to the writer last year. This has attacked three of the Queensland prickly-pears—viz., the common pest pear, the spiny pest pear of the Burnett and Rockhampton districts, and the tree pear (*O. tomentosa*); but its effects are so far practically negligible, as also are those produced by some of the cochineals from the recent consignment.

Apart from the bacterial disease which is at present being carefully studied in the laboratory, where it is giving promising experimental results, the most important enemy amongst those now in Brisbane seems to be the moth borer, *Melitara.* Judging from our previous experience, the South American insect *Zophodia* acts similarly. These moth-borers perform their destructive work while in the caterpillar stage, the grubs boring into the prickly-pear joints and feeding there gregariously until ready to spin the cocoons. Our pest pears are readily attacked by these organisms, which, like all the other insects referred to in this article, restrict their attentions to cactaceous plants. The larvæ of *Melitara* are at present hibernating, and it is hoped that during the forthcoming spring they will emerge and breed up. Until then, one cannot say that the importation has been successful. Many cocoons of this moth were sent across in cold storage, but none of the few which emerged laid any eggs, the result being perhaps due to unsuitable temperature while in the "cold room" of the steamer.

The bugs (*Chelinidea*), weevils (*Gerstæckeria*), and cochineals all seem to have settled down satisfactorily, and are breeding. Scavenging flies have bred out in large numbers from the Florida and Texan material sent across in cold storage, but nearly all have died, and since none have bred, it appears as if this portion of the work has not proved successful.

It should be mentioned that extreme care was taken in Texas and Florida to eliminate all parasitic or predatory insects whose activities would have been detrimental to the organisms which have been imported. This was done by breeding the material under careful supervision at Miami, in Southern Florida, the work having been carried out by the writer's lieutenant (Mr. Hamlin).

The South American fungi have not, as yet, given satisfactory laboratory results, as they have not responded well to our cultural methods. They are, however, very serious disease-producers in Argentina. Fungi generally require certain conditions of temperature, and especially moisture, for their greatest activity, and, when such are favourable, may cause considerable havoc. This is true of such forms as *Glœosporium,* which destroys the whole or part of the affected prickly-pear joint. *Montagnella* seems to be even more destructive in the field, and is capable of killing the entire plant.

In this biological attack on the prickly-pear pest, the writer is endeavouring to utilise organisms which act in various ways:—

(1) Firstly, there are those insects which actually eat pear—*e.g.,* moth-borers in their larval stage—and, to a less extent, the weevils and certain other beetles in both larval and adult stages.

(2) Then there are those which feed on the juices of the plant, interfere with its normal health, sicken it and may even poison it to such an extent as to kill part or the whole plant—*e.g.,* the cactus bugs and the various kinds of wild cochineal insects.

(3) Some insects attack and destroy the fruit wholly or in part—*e.g.*, certain midges, which have not as yet been imported (*Itonida, Asphondylia*).

(4) Injuries such as those caused by the first group allow the introduction of larvæ of scavenging flies which feed on the decomposing tissues, greatly aggravate the lesions and bring about a rapid destruction of the segment. Such organisms (*e.g.*, certain *Syrphidæ, Stratiomyidæ*, &c.) also passively assist in the introduction of sundry saprophytic fungi and bacteria which help greatly in the disintegration of the affected tissues.

(5) There are actual disease-producing organisms such as the fungi and bacteria referred to earlier in this article. Some are able to invade the plant through its stomata during warm moist weather (*e.g.*, *Glœosporium*). Others apparently enter through wounds whether made by insects, such as those referred to in (1), or made in some other way. No doubt sucking insects, such as cactus bugs, are capable of acting as inoculating agents for these disease-producers, especially the bacteria.

After having established the various organisms in the laboratory, experiments will be undertaken with a view to ascertaining whether any of them would be likely to become enemies of plants of economic value. When these tests shall have been satisfactorily passed, the pear-attackers will then be studied under field conditions in some selected prickly-pear centres. After that, such of them as prove to be of value will be distributed widely, but this is not likely to occur for some time, owing to the nature of the investigation.

When these desired and desirable natural enemies of prickly-pear shall have become fully acclimatised in Australia, they should then need little or no further attention after having been once liberated. They should go on propagating and attacking pear, their activities being controlled only by the climate and by the kind of pear attacked, unless some Australian parasite should adapt itself to these new hosts and thus limit their numbers and their usefulness. Biological control should then, theoretically, be ultimately inexpensive because natural. In some cases it has been necessary to keep a breeding stock under laboratory conditions to supply fresh material for districts in which conditions are not very suitable for some particular organism.

It is perhaps too much to expect that the new arrivals will act towards our prickly-pear as destructively (and as cheaply as far as expense goes) as the "Indian cochineal" did in regard to the "*Monacantha*" pear, but it is reasonable to hope that they will make a marked impression and so reduce the quantity of pear that the remnant will be more easily handled. Biological methods are the only means likely to be efficient in attacking pear in poor, inaccessible, or rocky country where time is not an important consideration, but where the excessive cost of chemical means of destruction would be. The biological attack, if successful, is likely to be much slower, but ultimately more effective, than the chemical; and, of course, the great difference in cost, not only at the time but in subsequent years, is also to be borne in mind.

This article has been written so that the public of this State may be aware of what is going on in regard to the attempted biological control of the pest, and also that the readers may realise that results cannot be promised within a definite time. The whole work is really a scientific investigation along certain special lines. As information of value becomes available, as a result of our experimental work, the writer proposes to make it known in the public interest.

GROUND COTTON SEED: AN EXCELLENT FEED FOR CATTLE.

By CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College.

There are several diverse elements in the present economic situation which have a close inter-relationship with regard to use of cotton seed as a feed, particularly for dairy cattle. Thus:—

(1) The war declared that we required to grow cotton within the Empire. Queensland is one of the countries where cotton of superior quality can be grown, and we are making strenuous effort to induce our farmers to plant this crop.

(2) The price of butter has fallen, and is likely to go still lower.

(3) Wages have risen to a marked degree, and, though they may fall again, it cannot be expected that they will ever reach the low level of pre-war days.

Let us briefly examine how these three elements react on one another.

With regard to cotton, it is improbable that Queensland will grow this crop on big plantations. Rather, our development of cotton-production will be along the lines of planting comparatively small areas on each farm. This means that the cotton will have to be transported to some central station to be ginned. It has to be remembered, however, that after the removal of the lint there remains a large quantity of seed which has a high commercial value, both for the oil and feed nutrients it contains. If the oil is extracted and the residue is ground into a meal (cotton seed meal), it forms as rich a feed for stock as linseed meal. But if the oil is not extracted, the whole seed can be ground, as it forms an excellent cattle-fodder. The fact that our cotton has to be removed from the farms for ginning largely prevents the farmers from appreciating the high feed value of cotton seed. But the feed value of the seed should be stressed, and, if once generally recognised, it will greatly enhance the commercial value of cotton-growing. Therefore, the seed from the gins should be returned to the growers for home consumption, or else it should be ground and sold on account of the grower. It is in this latter regard that dairy farmers can be of great assistance to the cotton-growing industry, and, by helping it, they will, incidentally, help themselves.

As before mentioned, the price of butter has fallen, and is likely to go still lower. The dairy farmer can meet this adverse situation in one of two ways. Either he may increase the number of cows per milker, or he may keep the number of cows the same and only use those of high productive value. If he adopts the first course he will make his milkers slaves to their work, and this is entirely against the general trend of labour development, a development which justly aims at better wages and better living conditions. If he adopts the second course, as he should, he has every chance of maintaining good returns, even against the lower prices for butter. Certainly, cows of high productive value cannot be readily bought at the moment, but they can be bred. Associated with such breeding, consistent herd-testing must be carried out. The present average production of butter per dairy cow per year is certainly below 150 lb. There is no reason why any dairy farmer should not improve his own herd so as to average 300 lb. to 400 lb. of butter per cow per year.

Quite obviously, if one man can manage twelve or fifteen or twenty cows, take whichever number you like, the wage he can earn is determined by the returns the cows give. If they average only 150 lb. of butter per year, the wage that can be earned is half of what could be got if the same number of cows averaged 300 lb. of butter per year.

But good cows cannot yield to their full capacity unless they get sufficient feed. Again, good cows pay to feed. To have a cow capable of giving 400 lb. of butter-fat per year, and to so feed her that she only gives 200 lb., is as bad as buying a 20 horse-power engine when your heaviest work only requires 5 horse-power.

In the foregoing an endeavour has been made to show that the dairyman can hope to meet falling butter prices only by using improved stock. Once he gets this improved stock he must prepare to feed them in the off-season, so as to obtain the greatest profit from them. For this feeding nothing could be a better concentrate than ground cotton-seed meal. This has been used at the Queensland Agricultural College for the past two years, with excellent results.

Some idea of the value of ground cotton-seed as a cattle feed may be formed by a study of the following descriptive details:—

In appearance, ground cotton seed is not attractive. Adhering to the seed there is a small amount of lint, and after grinding the meal it seems to contain a large amount of hairy fibre. The amount of this, however, is not great, nor has it any of the properties of hair. The cotton present is a vegetable fibre similar to the indigestible matter contained in all vegetable matter, and it has no bad effects on the animal. The flavour of cotton seed does not attract animals, and they may take a little time to get used to it. Once they get accustomed to it they eat it readily. Because cotton seed has a tendency to bind the animal, it should not be used in excessive quantities. Probably 5 lb. to 6 lb. per cow per day would be the greatest amount that should be used.

In order to obtain some idea of the comparative value of good cotton seed, the following grain rations have been run out:—

	No. 1.	No. 2.	Difference.
	lb.	lb.	lb.
Bran	194	162	32
Crushed Wheat	33	28	5
Crushed Maize	329	63	266
Linseed Meal	244	153	91
Ground Cotton Seed ..	—	394	—

Each of these feeds is of equal value for milk production, and would be used up to 1 lb. for each 3 lb. of milk given.

Thus, 394 lb. of ground cotton seed has the same value as the sum of the quantities shown in the third column above. If we take bran at ¾d. per lb., crushed wheat at 1d. per lb., crushed maize at 1d. per lb., and linseed meal at 1½d. per lb., the value of the cotton seed works out at about 1d. per lb., or, roughly, £9 per ton of 2,000 lb.

Ground cotton seed can be used for cattle, horses, and sheep, but it cannot be safely fed to pigs.

SPECIFICATION OF LABOUR AND MATERIALS REQUIRED IN BUILDING A PISE HOUSE AND FARM BUILDINGS OF ALL KINDS IN COUNTRY DISTRICTS.

By ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

In many country districts, especially when far removed from the railway, it is difficult, and often very expensive, to obtain usual building materials, such as bricks, cement, iron, and even sawn timber. In such cases it is useful to know how to utilise to advantage a material that can be found almost anywhere, and which costs nothing except the necessary labour to procure it. Earth can be used in several ways for walls, and if properly manipulated generally affords satisfaction. One method of using earth, adopted largely in Mexico and South American States, is that known as "Adobe" (pronounced "Doby"), which is really nothing more than sun-dried bricks, or blocks made of earth and clay and allowed to remain before use a sufficient time for them to become thoroughly hard. This material has been used in that form for hundreds of years in the countries named, and buildings still exist in good order after 200 years' exposure to the elements. There is, however, more labour in handling "Adobe" than in the more modern method of Pisé construction. In the latter case one handling is sufficient, as there is no waiting for the bricks to dry before using in the wall, Pisé being built *in situ;* drying is not therefore necessary. But even when using Pisé it is an advantage to have a few blocks of "Adobe" handy for use in difficult positions, such as corners, fireplace openings, &c. Another useful method is known as "Pug," or a mixture of chopped straw and mud, or, in some cases, long straw or grass may be used, thoroughly mixed with well-wetted earth in a hole in the ground; for mixing, a long fork or hoe is used, but if on a large scale, horse or some mechanical power should be available. No special appliances are required for this method of construction, as the material, after preparation, is simply laid on in successive layers about 12 in. or 18 in. thick, keeping them as upright and true as possible. The walls are then trimmed down by the spade or other suitable tools, and made all of one thickness and perfectly true and perpendicular. As the material is put together in a fairly wet condition, there is a certain amount of shrinkage, but it consolidates into a very hard mass and becomes very durable—warm in winter and cool in summer. The general wallwork can be done with unskilled labour, with proper supervision, but a skilled tradesman is necessary to cut out or trim up openings for doors and windows, and to keep the angles plumb. Very good and durable buildings can be erected on this system in the back country.

Another type of earth building is somewhat akin to that known as wattle and dab, but very much superior. It consists of a framework of saplings set into a sill adzed on the top side and laid on the level ground. The corner and intermediate studs are framed into the sides, the intermediate about 3 ft. apart, with heads and sills to doors and windows. Both the outside and the inside of the studs are then covered with 1½ in. mesh wire netting, which is held together and kept from spreading by wire loops, the length of which is equal to the thickness of the wall. These loops are placed at sufficient distances apart to prevent the netting from bulging. The space between the netting is then filled with very moist earth and rammed. It will be seen that the walls will be just the thickness of the saplings or studs. These walls can, if necessary, be plastered on both sides, as the wire netting forms a good key for the plaster, then whitewashed or coloured as desired.

In some situations this type of building would be very serviceable, and if a little skilled attention were paid to the roofing, which might be of bark laid symmetrically and whitewashed or coloured, a very comfortable residence would result.

The type of structure, however, to which attention is specially directed, and to which the following specification refers, is that known as Pisé, which combines all

the good qualities of the others and may be erected by any person in the bush who is handy with tools and can use the level and plumb bob.

The accompanying drawings are intended to illustrate a house of this character, and, in order that the process of building same may be thoroughly understood, the specification is written in plain language, avoiding technicalities as far as possible.

Before commencing operations, the builder should provide himself with moulds for the walls, rammers, and other necessary articles, as he cannot perform good and durable work without them. The plant required will depend on the number of men employed, and, as three is the minimum number to perform the work economically, the following will be necessary:—A horse and dray or some other means of transporting the material to the building, two wooden rammers, two plasterers' wood floats, two straight boxes or moulds, two angle boxes, some short lengths of light wood for blocking up the ends of boxes, a supply of sawn scantling of different sizes, some ⅜-in. bolts, nuts and washers, gauge rods, shovels, spades, a watering can, buckets, tank or barrel for water, and some other articles which will be necessary as the work proceeds.

After collecting the plant and fixing the site, the first thing to do is to prepare the foundations. To do this the building must be accurately set out and the correct position and thickness of all walls pegged out, the pegs being put in about 3 ft. outside the intersection of walls, so that they are not disturbed when excavating the footings. It may be well to point out that, in setting out buildings perfectly square with walls at right angles, a good-sized square is necessary, which can be easily made by anyone out of long battens or flooring boards. The correct angle is assured by measuring one side 6 ft., the other side 8 ft., with the hypotenuse or diagonal between the above points exactly 10 ft., or any multiple of the same.

The footings of all walls should not be less than 9 in. wider than the walls they carry, projecting 4½ in. on each side. In suitable ground they need not be more than 4 in. in depth, which will be obtained by taking off the top sod to that depth. If the ground slopes, the footings should be stepped; that is, they should be excavated level for short distances, then a step should be left, and another length taken out level. These footings should then be well watered before placing any material in them; when filled in, they should be well rammed and made quite level and flat on top. Before proceeding with the walls, the boxes or mould must be prepared of any convenient size and of any kind of wood that will not twist or warp, the lighter the timber the easier it is to handle. It will be found generally that 2 ft. is a convenient depth for boxes for ordinary buildings, but for large buildings 3 ft. may be a more suitable depth. Twelve inch by 1½ in. boards, with ledges on the outside, will be found convenient, and a broad ledge or brace should be placed at each end. The ledges should be about 2 ft. apart, and ½ in. iron bolts, long enough to go through the walls, with heads, nuts and washers provided for bolting the boxes together. A set of one dozen iron angle-brackets should also be provided for securing the boxes at angles, otherwise it will be difficult to keep the angles plumb and true. Care must be taken in fixing the boxes to have them perfectly level and plumb, and a little time and patience in accomplishing this will often save much annoyance, resulting from the walls out of plumb.

The door and window frames should also be prepared and ready for use when required, as they should all be built in as the work proceeds.

The next thing to do is to remove the turf from the ground and give the earth a fairly good soaking with water, so that when pressed together in the hand it will adhere and form a solid mass. It must not, however, be too wet, or it will not compress properly when rammed. All roots and timber should be taken out, also all large stones. Fill in the boxes from 6 to 12 in. high at one time, and well ram the same. The wall will then set firm and hard, and be impervious to storms.

The provision of a damp course must not be neglected, as the ground moisture will gradually rise by capillary attraction, and cause discomfort in the rooms. This will probably not be noticed for a long time after completion, but as the earth is always more or less damp, sooner or later, unless prevented by some means, its effects will be seen and felt. In brick and stone buildings special damp-proof courses are built in, just below the ground floor level; and in Pisé construction a good damp course may be formed by building in the wall, for its whole width, just above the ground line, a sheet of malthoid (1 ply), which will be thoroughly effective. This should be carried through all door and french light openings, and lapped 6 in. at joints.

All door and window openings should be boxed up carefully as near as possible to the finished sizes, so that little or no patching up will be required.

Cypress pine plugs should be built in all door and window jambs, heads and sills, as shown on detail drawings. These are necessary for securing frames and linings, and to a large extent will make subsequent plugging unnecessary.

All openings should have good Cypress pine lintels, having at least 1 ft. bearing on the walls at each end, those over verandah openings to be whole logs adzed on the underside, resting 18 in. on the wall at each end, each face of the same to have stout nails driven in a few inches apart, which will form a key for a plaster cover. The faces of these lintels may be lined with Cypress pine, or they may be covered with cement compo, or lime plaster with a small quantity of cow's hair mixed in same; the nails before mentioned will form a key to hold it to the timber, and, when floated off with a wood float and finished with the Pisé wall, will be durable and effective.

In districts where cement can be conveniently obtained, the heads and sills of ordinary openings could be made of cement concrete in the proportion of six parts gravel, containing a good proportion of sand, and one part of cement. These could be reinforced and made very strong by inserting in same a few strands of barbed wire turned over at the ends so as to prevent them drawing out.

The fireplace should be faced with brick or concrete, the hearth laid with cement, and the chimney built either of brickwork with a 9 in. flue or of concrete with a 9 in. drain pipe built in for the flue, finished on top with a flue pipe projecting about 6 in. above a bevelled cap.

All the Pisé walls—both sides—should be lightly sprinkled with water and worked over with the wood float, using screeds where any straightening is required.

The top plates should be secured in position on the walls, as shown in detail drawing.

Openings to be left in all walls for ventilation just below the ceiling line, by building in boxes specially prepared and of suitable sizes, ventilators to be not less than 2 ft. 6 in. by 1 ft. 6 in., and to be placed generally over doors and windows.

Build in woodplugs 4 in. by 2 in. and the thickness of the walls at intervals of 3 ft. for securing skirtings, dados, picture rails, architraves, &c.

CARPENTER AND JOINER.

Joists to be of 5 in. by 2 in. Cypress pine resting on 4 in. by 2 in. plates on the walls and on piers where the bearing exceeds 10 ft. Joists to be spaced 18 in. apart, centre to centre; verandah floors to be laid with a fall outwards of 1½ in. where exposed to the weather.

Provide ready for building in, and mark the correct position for all plugs, stays, and braces, also all plates, and provide and carefully fix all door and window frames as shown on detail drawing.

All door and french light frames to be 5 in. by 4 in. solid Cypress pine, with heads and weathered and sunk sills grooved for tongue of linings and fitted with stops, &c., necessary for door hanging.

If preferred, the grooving in the frames may be dispensed with in most cases, and a fillet nailed on the back of the solid frame to which the lining can be nailed.

All door, french light, and window frames to have 1¼ in. Cypress pine wrot linings, tongued into the frames or nailed securely to fillets at the back of the frames, to be finished on both sides with 4 in. by 1¼ in. plain chamfered architrave. Windows to have 1½ in. sills on the inside, with 2 in. nosing and scotia under and a 2 in. sill on the outside, laid to a bevel with returned ends, sufficiently wide to carry the architrave. French lights to have 1½ in. sills both sides, in addition to the solid 5 in. by 4 in. sill of the frame. Window frames to have mullions, as shown, with all necessary stops for casements. Four inch by 2 in. wood plugs to be built into walls every 3 ft. in height of opening to nail linings and architraves to. Ceiling joists to be of Cypress pine, round timber, not less than 7 in. in diameter, adzed flat on the top for receiving the ceiling linings; joists to be spaced not more than 3 ft. centres, and to be notched into wallplates, and extend 3 ft. over the face of wall, the ends of same to be cut off true to line for fascia board, and cut slightly back below the fascia.

Ceiling joists of verandahs to be similar to the above, trimmed into each other where necessary, and spaced not more than 3 ft. apart, centre to centre.

Rafters, collars, and braces to be 4 in. by 2 in. sawn Cypress, spaced to suit the ceiling joists, bevel cut where necessary, and securely nailed. Ridge to be 8 in. by 1¼ in., eaves fascia dressed 7 in. by 1¼ in., battens 3 in. by 1½ in., spaced so as to have not less than three battens under every sheet. Batten up valleys and hips with an extra thickness at eaves.

Lay all floors with 6 in. x 1 in. grooved-and-tongued Cypress pine flooring, well cramped up, and nailed with two nails to each joist and dressed off at completion.

Ceilings and soffits of eaves to be lined on top of ceiling joists with 6 in. by 1 in. t. and g. Cypress pine, with scotias and fillets at all angles.

Build in walls plugs for nailing skirtings, chair rails, picture rails, &c., at suitable distances apart, plugs to be of such size as to be completely covered by the timber work to which they are nailed.

Fix round inside walls of all rooms 6 in. by 1 in. chamfered skirting, scribed to the floor and to architraves.

Fix 4 in. by 1½ in. chair rail, chamfered on edge, round the walls of living room, bedrooms and kitchen, and 2 in. by 1½ in. pictures rail round the same rooms.

Build the stove recess in kitchen, as shown on drawings, with 3 in. by 2 in. studs, lined with iron on the outside, and finished as shown, with cement hearth. Two small lights to be built in recess, fitted with 1½ in. rebated frames with 16 oz. sheet glass, and hung on pivots with cords for opening same and suitable fasteners.

Frame for outside wall of sleeping verandah with 4 in. by 3 in. studs on a 4 in. by 2 in. bottom sill and capping piece, with a 6 in. by 2 in. weathered and throated sill projecting 2 in. from the face of the wall, and a 4 in. by 2 in. top plate. Studs and mullions to run through from bottom to top, and checked into head. Panels below openings to be filled in, either with 4 in. by 1 in. g. and t. Cypress pine or with fibro-cement sheeting ¼ in. thick, and secured in position with fillet on both sides.

Fix 12 in. by 1½ in. mantel shelf and jambs to kitchen fireplace, and a pine mantel and jambs to the living room.

Fix 50 ft. super of 12 in. by 1 in. shelves in kitchen, on brackets properly secured to wall plugs.

Provide and fix tank-stands, where shown, with hardwood or Cypress pine stumps, and hardwood joists, and 6 in. by 1½ in. sheeting.

French lights to be 3 ft. 6 in. by 7 ft. by 1¾ in. pine with moulded and rebated bars 1 in. thick, double hung with 4 in. butts, and fitted with two bolts on the inside, and rebated mortise locks with brass or oak furniture.

Doors in kitchen to be 1¾ in., framed and ledged and filled in with 1 in. g. t. and v.-jointed pine, hung with 4 in. butts and fitted with 6 in. rim locks with brass furniture.

Door from living room to back verandah to be 1¾ in. framed with moulded, rebated and glazed panels hung with 4 in. butts and fitted with rim lock as before.

Other doors to be 1¾ in. four panelled pine, hung as before, and fitted with 6 in. rim locks with brass furniture.

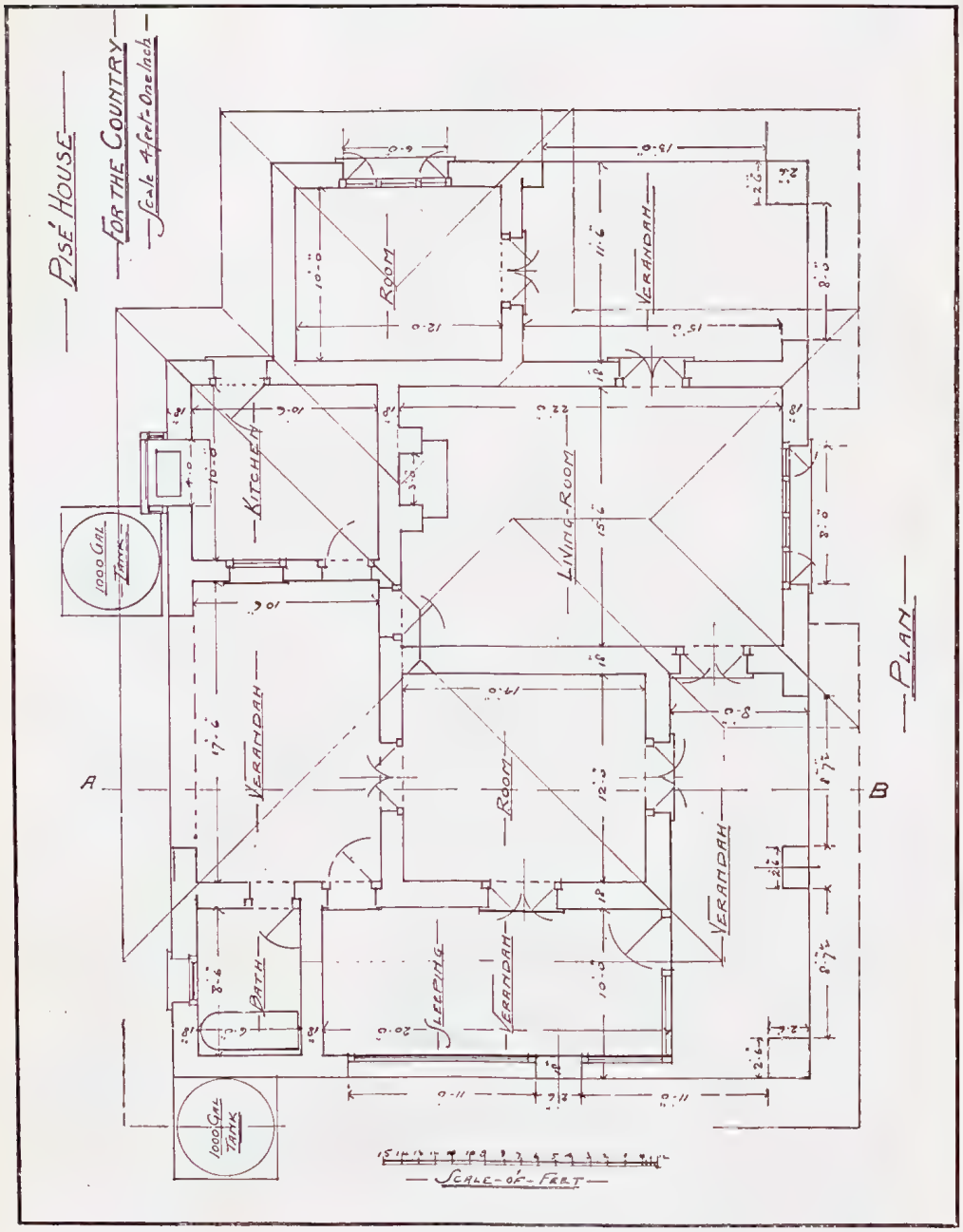
All windows throughout to have 1¾ in. pine casements with moulded and rebated bars 1 in. thick, glazed with 16 oz. sheet glass, well sprigged, puttied and back puttied, hung with 3 in. butts and fitted with bronze casement fasteners and 4 in. bolts. All casements, where possible, to be hung to open outwards.

All doors and windows throughout to be fitted with stops the necessary widths and thickness required.

Fix bronze hooks in suitable position for fastening back french lights and doors.

Fix in each room over door and window openings lattice work ventilators made with openings 1 in. square, 2 ft. 6 in. by 1 ft. 6 in., and provide all necessary stops and linings to same.

Finish round all doors, windows and other openings with 4 in. by 1 in. chamfered architraves on both sides.


PISE' HOUSE
FOR THE COUNTRY
Scale 4 feet = One inch
PLAN
ROOM
VERANDAH
KITCHEN
LIVING-ROOM
1000 GAL TANK
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A
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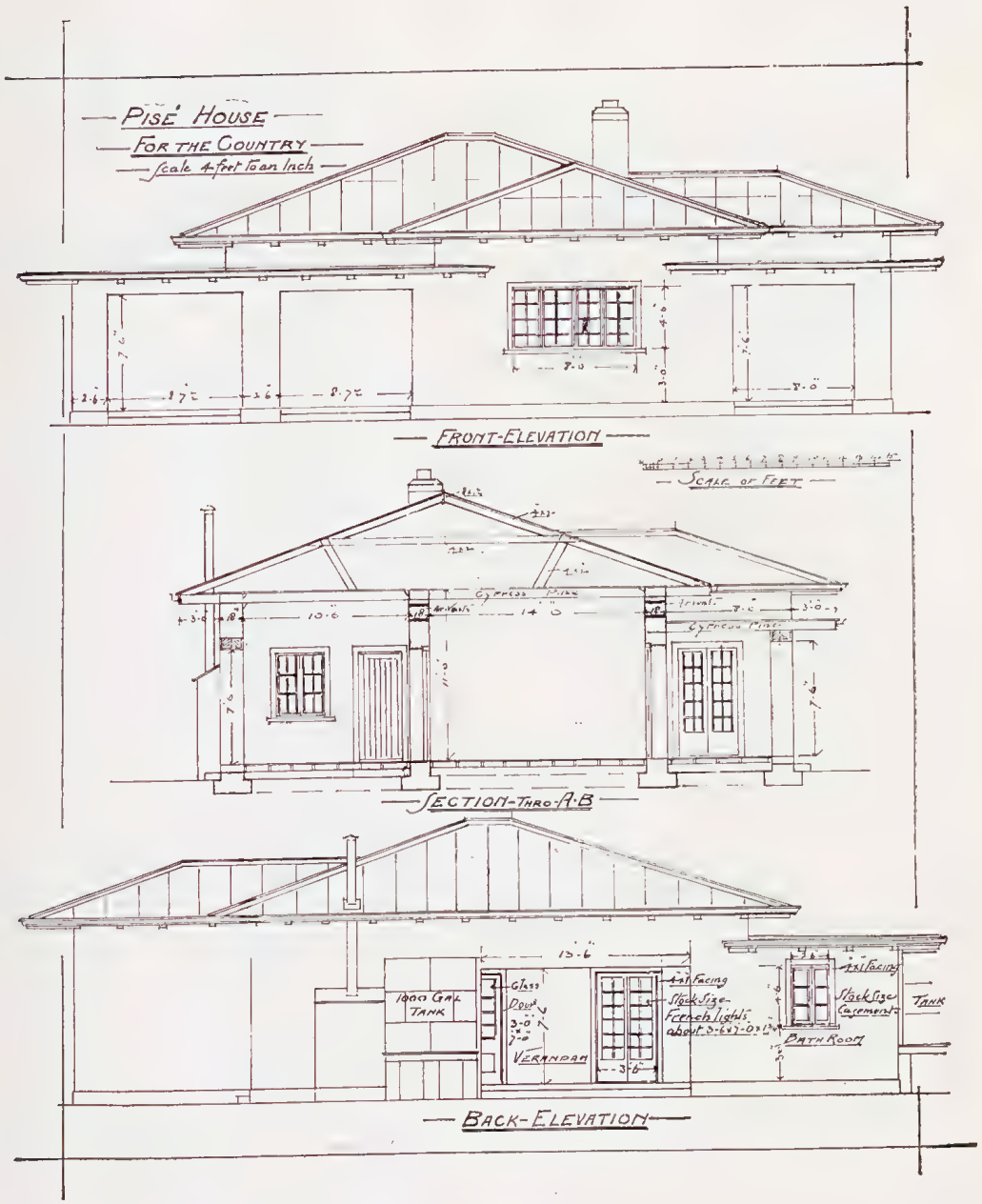
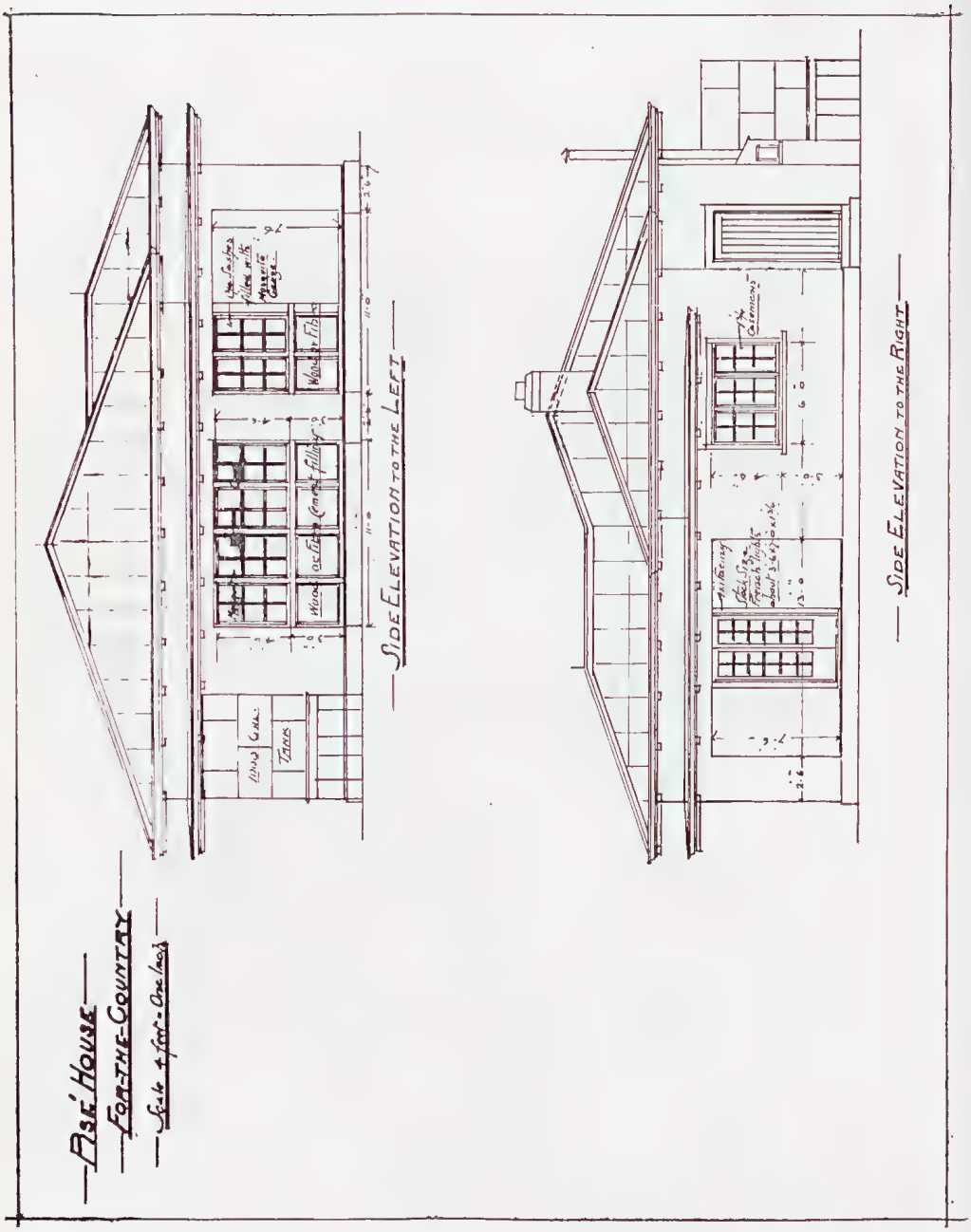
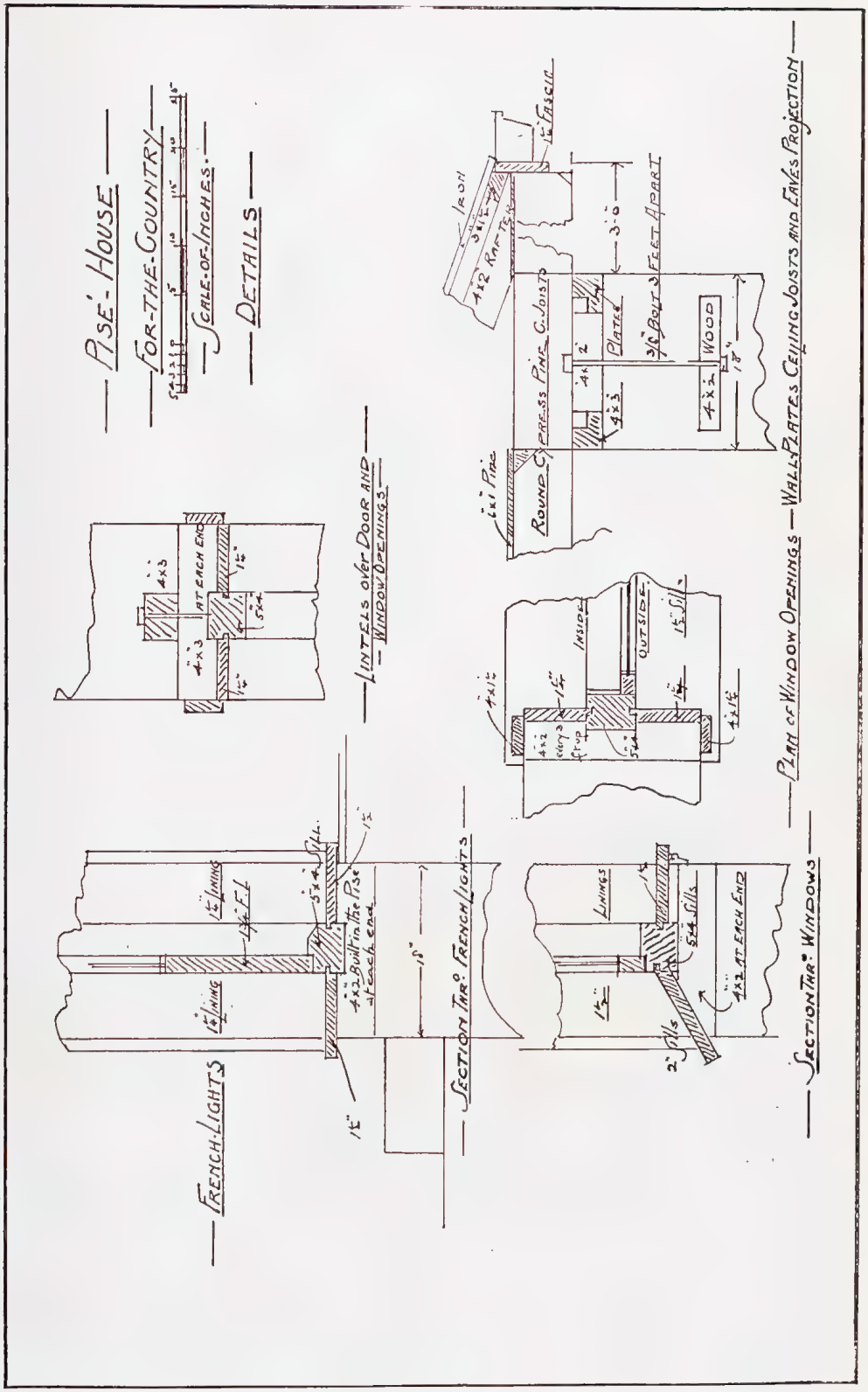
SCALE OF FEET


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet to an Inch
FRONT-ELEVATION
SCALE OF FEET
SECTION-THRO-A-B
1000 GAL TANK
VERANDAH
BATH ROOM
TANK
BACK-ELEVATION


—BSE HOUSE—
—FOR-THE-COUNTRY—
—SIDE ELEVATION TO THE LEFT—
—SIDE ELEVATION TO THE RIGHT—


PISE'-HOUSE
FOR-THE-COUNTRY
SCALE-OF-INCHES.
DETAILS
FRENCH-LIGHTS
SECTION THRO' FRENCH LIGHTS
LINTELS over DOOR AND WINDOW OPENINGS
PLAN OF WINDOW OPENINGS
WALL PLATES CEILING JOISTS AND EAVES PROJECTION
SECTION THRO' WINDOWS
4x3 AT EACH END
5x4
1½" Lining
1½" F.L.
3"x4" Sill.
4x2 Built into Pise at each end
18"
4x2 AT EACH END
Linings
2" Sills
INSIDE
OUTSIDE
1" Sill
4x1½
4x2
Round Cypress Pine C. Joists
1½" Fascia
3x1½ Rafters
Iron
4x2 Plates
3/8" Bolts 3 Feet Apart
4x3
WOOD
3'-0"

Fill in sashes on sleeping verandah with mosquito-proof wire gauze, and fix same with stops on both sides, well secured.

These sashes may be made with bars 1 in. thick, moulded on the outside, but left flush at the backs, so that the mosquito-proof gauze will pass over the bars and be secured with a stop planted on the back.

Provide and fix, where pointed out, one dozen bronze hat and coat hooks on 5 in. by 1 in. chamfered rails, and provide and fix in kitchen one dozen cup hooks.

Do all the work necessary to complete this branch in a satisfactory manner.

PLUMBER.

Roof of verandahs to be covered with 2-ply malthoid, laid as instructed by the selling agents, on close boarding provided and fixed by the carpenter, turned up against walls, properly flashed, and joints cemented as instructed by agents, to be left perfectly sound, weatherproof, and satisfactory.

Five inch by 4 in. galvanised-iron spouting to be fixed to all eaves, on brackets as required, with soldered points, stop ends and angles. Water to be conducted to the tanks with all necessary 3 in. down pipes.

Other roofs than the above to be covered with 26-gauge galvanised iron, approved brand, laid with 1½ in. corrugation at sides and 6 in. at ends. Valleys to be laid as shown, with 24-gauge plain iron; cover hips and ridges with 24-gauge 16 in. wide, lead-headed nails to be used throughout.

Provide and fix two 1,000-gallon tanks, with mosquito-proof hoppers and frog-proof overflows, fitted with cleansing plugs and lever taps.

Provide and fix a 5 ft. 6 in. galvanised-iron corrugated bath, with waste plug and chain. Connect a 2½ in. waste pipe to same, and convey it to a suitable position outside to be approved.

Provide and fix over same a shower bucket with rose and lever tap cords, pulleys and block for hoisting and lowering.

Cover the inside walls of bathroom up to a height of 5 ft. with small corrugated galvanised-iron sheeting, with roll on top.

Provide and fix a stove in kitchen, value £ net cost; fix stove piping, and carry up same above roof, flashed where necessary.

PAINTER.

Knot, stop, rub down and properly prepare all wood and iron work for painting which is usually painted, such as eaves, gutters, down pipes, fascias, outside doors, and windows. All the above woodwork to be painted three coats approved colours with approved linseed oil and white lead, ironwork to have two coats only.

Inside doors and windows, skirtings, picture rails, chair rails, &c., to have two coats of best approved varnish.

All outside walls to be twice coated with limewash containing half a pint of raw linseed oil to each gallon, and inside walls to be coated with limewash as above, but coloured by the addition of any suitable dry colours.

MIXING OF FERTILISERS.

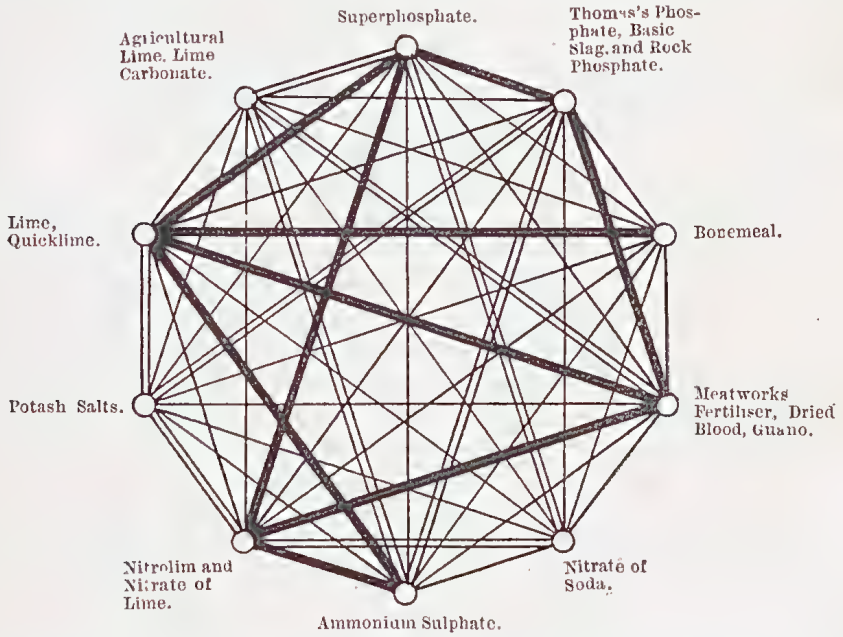
By J. C. BRÜNNICH.

Many of the users of fertilisers prefer to make their own mixtures, specially suited to their requirements, instead of using ready-mixed complete fertilisers; but, in order to do this successfully, it is absolutely necessary to have a knowledge of what kind of fertilisers can be safely mixed.

In many cases great losses of the most valuable of all fertiliser constituents—the nitrogen or ammonia—have been caused by mixing lime or fertilisers containing lime with sulphate of ammonia, bone dust, and meatworks fertilisers, &c.

In other cases, by some chemical changes or by absorption of moisture from the air, the mixture sets very hard or becomes lumpy in the bags, and, therefore, difficult to apply.

The diagram below, originally devised by Dr. Geekens, and used for some time in our publications, has been amplified and modified to apply to local conditions.:—



All fertilisers joined by a *single line* can be safely mixed together and kept for any length of time. Fertilisers joined by a *heavy black line* should never be mixed together; those connected by a *double line* should only be mixed immediately or a short time before application.

Great care must be taken when making mixtures of fertilisers, and all lumps must be broken up and, if necessary, passed through a sieve before mixing. The various portions should be carefully and thoroughly mixed in small quantities, and the small heaps formed turned over a few times and then all mixed together. It is sometimes better to allow the mixture to remain in heaps for some time before bagging, to prevent forming lumps or setting hard in the bags.

A NEW GRASS PEST OF THE ATHERTON TABLELAND.

By ALAN P. DODD, Assistant Entomologist to the Bureau of Sugar Experiment Stations.

During the drier months of 1920, viz., July to November, the farmers of the Atherton Tableland became seriously perturbed through the ravages of a grass caterpillar that threatened to destroy a great proportion of the pasture in certain areas. Dr. J. F. Illingworth made a brief visit to the district, 29th September to 3rd October, 1920, and subsequently the writer made two short excursions to the locality, 1st to 5th March, and 10th to 13th April, 1921. Our knowledge of the pest has been obtained from these limited investigations, and is embodied in the following report. I have to thank Dr. Illingworth, who has kindly allowed me to make free use of his notes. My thanks are also due to the many farmers who have helped us in our survey, and through whom we were enabled to make as complete an examination as time permitted.

HISTORICAL AND GEOGRAPHICAL.

The moths were submitted to Dr. A. J. Turner, of Brisbane, a well-known authority of *Lepidoptera*, who determined them as *Oncopera Milocera* Turner, a member of the family Hepialidæ, the larvæ of most of which tunnel in the trunks and roots of living trees, and are often of very large size. Dr. Turner writes, "There

are only two species of *Oncopera* (the writer has accepted Dr. Turner's spelling of the word *Oncopera*, though it is usually written as *Oncoptera*); *O. intricata* occurs commonly in Victoria and Tasmania." It is interesting to record that *O. intricata* is a well-established grass-destroyer in these States, and its habits are practically identical with our species. In the "Destructive Insects of Victoria," 1909, French calls it "the dark-green grass caterpillar," and writes that "the larva of this moth is, without doubt, the most destructive of all grass-eating grubs known to myself."

Oncopera Mitocera appears to be confined to North Queensland, and possibly to the Cairns district. Early in 1911, Mr. F. B. Dodd observed the moths flying very plentifully at dusk, on the edges of the Evelyn Scrub, near Herberton. The first record of the insect as a pest seems to be contained in a letter written by Mr. J. George Jones, of Ravenshoe, 15th September, 1919, in which he states that it was "then engaged in clearing out patches of good pasture in this district." No word of its occurrence around Yungaburra was heard until August, 1920, when the farmers suddenly discovered that a new and serious pest had appeared among them. Probably the caterpillars had been there for several years; in fact ever since the clearing of the scrub, but never in such numbers as to attract attention. The moths have been noticed in considerable force at Kuranda, and we know that the larvæ occur in the scrubs around Babinda. Thus the species is found at all heights, from sea-level to 3,500 ft. in the Cairns district.

DESCRIPTION OF THE STAGES.

The moth measures 1½ to 1¾ in. across the outstretched wings; it is of a rather rich brown in colour, the forewings somewhat irregularly mottled with darker and lighter shades, the hindwings uniformly sooty. The wings are rather narrow, the hindwings longer than is usual and inclined to be pointed. The body is long and slender, and the head has a conspicuous clothing of woolly hairs.

The larva or caterpillar is long and slender, measuring up to 3 in. in length, of a dirty dark-green colour; the head is brown and hard. They are very active, and wriggle convulsively when handled or otherwise disturbed.

The chrysalis or pupa is of a light brown, the head darker, hard, and roughened; it measures about an inch in length; the body segments are each armed with two transverse rows of close saw-like teeth, which serve to propel it up the vertical shaft and prevent it from slipping down to the bottom.

LIFE HISTORY AND HABITS.

The moths are on the wing during the late summer; only an odd one was observed by the writer early in March, and it was obvious that the main emergence had not taken place. However, by the middle of April, though they were plentiful enough, it was evident that the main brood was over. The eggs are probably laid scattered about the ground among the grass. Each female is capable of depositing a vast number. When held tightly between the fingers they will lay strings of tiny creamy-yellow eggs.

There is little doubt that the life cycle is completed within a year. Early in October it was found that the larvæ were about two-thirds grown; by the first week of March excavating in numerous places gave full-grown and pupating larvæ, and pupæ; by the middle of April no larvæ could be found, and only a very occasional pupa, the moths then being on the wing.

The caterpillar constructs a vertical shaft or tunnel of about the diameter of an ordinary lead pencil, varying from 5 to 16 in. in depth, and lined with strong, fine silk. In the pasture lands the tunnels are covered with a mat of webbing and frass, but in the scrub, strange to say, no covering is constructed, the holes being bare and open. Thus it would seem that this protection is a habit acquired in the few years that the caterpillars have adapted themselves to the changed conditions of the open fields, from the shade and shelter of the scrub. The larvæ clean out their tunnels, placing the excrement on the surface near the opening, and this is the most easily recognised feature of the pest. The tunnel is quite straight, without cross-sections; in this the caterpillar lives, coming up at night and reaching forth to feed on the grass blades. Apparently fresh leaves are not essential, for in the scrub the surface of the ground is bare of vegetation, and here, no doubt, fallen leaves and decayed vegetable matter are consumed. It does not seem feasible that they travel through the soil; in fact, they are not hardy creatures, and when taken from their tunnels and placed in fresh soil, frequently die, though in some cases they live and construct new tubes. Although it is a generally held opinion that grass roots

are eaten, this does not seem correct, at least as regards underground roots. The grass apparently dies through the action of the caterpillar gnawing at the stock and back on to the base of the roots from the surface.

When ready to pupate, the larva becomes almost milky-white in colour. The pupa or chrysalis rests at the bottom of the tunnel, its horny head protecting it from intruders. When ready to emerge, it works its way to the surface, and projects about one-third of its length above the ground; thus, when the moths are on the wing, it is quite usual to see these empty chrysalis shells poking out of the ground.

Vast numbers of moths do not feed in the adult stage, and *Oncopera* is one of these; hence its aerial life must be comparatively short, probably about a week. The moths fly at dusk, before it has become dark; in a few minutes myriads are on the wing, in a wild, erratic, jerky, and very fast flight. The flight lasts for a few minutes, and ends as suddenly as it began. A few are attracted to lights, but not in sufficient numbers to suggest trapping. During the day they settle in a sheltered and, often, dark position; in the fields they can be captured commonly, resting on stumps of trees, or on walls of buildings, &c.

NATURE AND EXTENT OF INJURY.

There is no doubt that the species in question is a native of the scrubs, as the tunnels can be located in numbers anywhere in such situations around Yungaburra and Ravenshoe, and we have observed them in virgin land at Babinda. With the clearing of the land and its planting to grass, favourable conditions have arisen for rapid increase; and, too, its natural enemies in the scrub would not be liable to change their habits so readily and follow their host into the open. We can safely say, then, that these factors have accounted for its sudden development as a pest of serious dimensions. The principal area affected is immediately around Yungaburra, from Kulara on the north to Kureen on the south; in the older-settled portions, near Atherton and Kairi, it has not made its appearance; and southward, around Malanda, though the caterpillars were found abundantly in the scrub, none could be located in the pastures. Another area infested, though not to the same extent, is situated eastward from Ravenshoe, on the higher land toward the Beatrice River, at a height of 3,200 to 3,500 ft. above sea level.

The pest occurs throughout there areas, almost each farm being more or less affected. In the worst situations the paspalum and Rhodes grass have been killed out in small patches; as a result, the fields present a very ragged appearance instead of a luxuriant carpet of grass. In any case, where the caterpillars occur in any number the pastures are seriously depleted and, therefore, cannot carry their full complement of stock. As the pest does its chief damage during the drier parts of the year, when good grazing is most needed, this is a serious matter. Where they occur abundantly, as many as thirty larvæ can be dug up in a cubic foot of soil. Early in the year they have finished feeding, and the summer rains invigorate the grass, so that in many instances, especially in the case of paspalum, there is soon a splendid growth, but bare patches every here and there testify to the work of the scourge.

NATURAL MEANS OF CONTROL.

Our limited investigations allowed almost no breeding work, and, therefore, no parasites were discovered. Jumping spiders catch a few of the moths, and they are also frequently caught in spiders' webs.

No doubt, nightjars, that hawk over the fields at dusk, destroy many of the moths, but in the open fields of the Tableland the absence of birds which might help materially to check the ravages of the pest is very marked.

Climatic conditions must be an important factor in the increase or decrease of these caterpillars, and heavy rain, or an excessive wet season, may go far toward restricting their numbers. The month of March, 1921, was exceedingly wet, heavy and continuous rain falling. At this time the insects were either in the pupal or in the moth stage; in the latter case probably many were drowned, and their eggs destroyed. When the locality was visited in April, it was found that the coverings of the tunnels had been washed away, and often the mouth of these shafts had been covered over with silted earth; indeed, in one badly infested field, dead pupæ were found that had failed to break through the soil washed over the opening. A case was heard of where the larvæ were prevalent in a low-lying field earlier in the season; the first heavy rain flooded this land, and the caterpillars came to the surface in thousands and were washed away. Many farmers are of the opinion that the very heavy rainfall of March has given the pest a grave setback, and the writer is inclined to share their views, but it remains to be seen how serious this insect will be in the ensuing season.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR JUNE, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Prim	Holstein ...	9 Mar., 1921	1,197	3·5	46·48	
Wattle Blossom ...	Guernsey ...	24 May ,,	715	5·2	43·50	
College Cold Iron	Jersey ...	13 Mar. ,,	795	4·8	42·90	
Hedges Nattie ...	Holstein ...	26 Feb. ,,	1,057	3·5	39·33	
Charming Damsel	Ayrshire ...	12 May ,,	698	3·7	28·75	
Netherhall Queen Kate	,, ...	17 April ,,	667	3·6	26·65	
Lilia	,, ...	3 April ,,	595	3·8	25·30	
Hedges Dutchmaid	Holstein ...	26 May ,,	713	3·2	24·32	
College Evening Glow	Jersey ...	10 Nov., 1920	528	6·2	23·79	
Confidence... ...	Ayrshire ...	8 Feb., 1921	569	3·7	23·35	
Miss Fearless ...	,, ...	25 May ,,	612	3·2	22·95	
Maggie's Leda ...	Jersey ...	6 Oct., 1920	382	5·0	22·34	
Gatton Empire Lass	Guernsey ...	3 May, 1921	467	4·1	21·42	
Thornton Fairetta	Jersey ...	15 Mar. ,,	326	5·5	20·97	
Confidante ...	Ayrshire ...	12 May ,,	462	4·0	20·58	
Leda's Jessie ...	Jersey ...	14 Jan. ,,	240	7·0	20·39	
Dawn of Warragaburra	,, ...	15 Oct., 1920	329	5·2	20·01	

NOTE.—Only cows producing 20 lb. of butter, or over, for the month are included in this list. The rainfall at the College for the month of June totalled 608 points.

PROBLEMS OF COLD STORAGE.

How much of the world's food supply is now kept in cold storage is difficult to say, but it must form a very large part of the total of perishable foodstuffs. It is not surprising, therefore, that the problem of getting the atmospheric conditions in cold storage premises exactly right for the long preservation of food has attracted the attention of the scientific mind. One phase of the problem is to secure the right degree of humidity or dampness in the atmosphere. For ordinary weather readings a wet and dry bulb thermometer is used, but in cold stores it is not reliable unless it is in a constant draught. An instrument recently exhibited before the Royal Society of Great Britain has a wet and dry bulb mounted in a tube through which a tiny electric motor draws a current of air. In another dampness measurer, designed to give a reading at a distance, the dampness affects a hair, to which a pointer is hung. The principle is the same as in the old familiar "weather house" with doors, through which a man or a woman emerged according to whether the air was dry or damp. In this instrument, however, the pointer moves over a drum which is really a resistance coil, and the degree of dampness is ascertained by measuring the electrical resistance at the point where the pointer is in contact with the coil.

The Horse.

CERTIFICATES OF SOUNDNESS.

List of Stallions registered and certified as sound, in the course of the month of June :—

Name of Horse.	Owner's Name and Address.
Blood Stallions.	
Roseacre (L)	Wilson and McDouall, Calliope Station, Calliope.
Trotters.	
Blainwood (L)	D. Wilson, Brisbane.
Harold Beldon	H. V. Leslie, Rosewood, Kalkie.
Ponies.	
Ashton (L)	N. V. Nielsen, Targo street, Bundaberg.
Young Gaffer (L)	A. T. Noyes, Alexander road, Clayfield.
Togo	T. R. Kennedy, Gladstone.

SOMETHING NEW IN WINDMILLS.

Many attempts have been made to solve the problem of efficiently utilising the winds as a means of generating electricity. The difficulties arise from the extreme variations in the force of the wind and from the liability, even in windy regions, to periods of calm during which no power at all can be obtained. These conditions suggest that wind power should be used only as an auxiliary to some other source of energy, such as the burning of coal or oil. Now that fuel of all sorts has multiplied in price, there is all the more reason for considering the possibility of turning the wind to account. Hitherto, the usual plan has been to use a large slow-speed windmill to drive a dynamo at a high speed through gearing—a rather wasteful arrangement. During the war, however, there was in Great Britain a remarkable development in the design and construction of small high-speed dynamos on aeroplanes. These dynamos were direct-coupled to propellers, or rather "impellers," driven by the wind created by the aeroplane in flight. A British firm has devised a scheme for fitting three or more of these wind-dynamos on the swivelling top of a vertical pole, with a vane to keep them in position against the wind. Each equipment gives 60 watts, and the arrangement forms a cheap and efficient auxiliary to the ordinary country-house lighting installation. The energy produced is, of course, stored in accumulators in the usual way. The operation of the plant is entirely automatic, and it is so light and simple that it presents no obstacles in erection and maintenance.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JUNE, 1921.

There was a drop in production for the month, due to the excessive rainfall. In the second week over 5 inches of rain fell. The light breeds took unkindly to the conditions, a number moulting, and others going off for several days. During the last week the heavy section made a big improvement. Generally, the health of the birds is splendid. There were seven cases of broodiness. Two deaths were recorded, viz., Mr. Harrington's Rhode Island Red, from ovarian disorder, and Mr. Newberry's White Leghorn, inflammation of the bowels. The following are the individual records:—

Competitors.	Breed.	June.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	95	349
H. C. Thomas	Do.	102	347
F. Birchall	Do.	110	343
*G. Trapp	Do.	114	347
*W. and G. W. Hindes	Do.	112	327
*J. M. Manson	Do.	125	315
Oakleigh Poultry Farm	Do.	112	313
*H. Fraser	Do.	119	309
*C. M. Pickering	Do.	107	306
*H. C. Towers	Do.	108	303
*Mrs. R. Hodge	Do.	105	302
*J. Newton	Do.	94	296
R. C. Cole	Do.	91	295
W. A. Walson	Do.	72	294
O. C. Goos	Do.	87	278
*W. Becker	Do.	96	262
*T. Fanning	Do.	112	261
Bathurst Poultry Farm	Do.	105	258
*Chris Goos	Do.	83	255
*R. C. J. Turner	Do.	67	253
Mrs. E. White	Do.	81	253
J. W. Short	Do.	78	253
W. Barron	Do.	99	253
*E. Chester	Do.	94	251
E. Stephenson	Do.	85	243

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	June.	Total.
LIGHT BREEDS—*continued.*			
M. F. Newberry	White Leghorns... ...	80	242
*Thos. Taylor	Do.	84	233
Mrs. E. Z. Cutcliffe	Do.	97	231
H. Stacey	Do.	111	2 9
*E. A. Smith	Do.	82	225
*S. L. Grenier	Do.	86	225
*Mrs. L. Anderson	Do.	81	223
*Haden Poultry Farm	Do.	71	222
*Thos. Eyre	Do.	72	222
*G. Williams	Do.	84	216
*B. Chester	Do	76	213
*W. and G. W. Hindes	Brown Leghorns	60	209
Linquenda Poultry Farm	White Leghorns ...	104	195
W. M. Glover	Do.	84	178
Brampton Poultry Farm	Do.	58	162
*H. P. Clarke	Do.	97	162
HEAVY BREEDS.			
Jas. Porter	Black Orpingtons ...	136	406
T. Fanning	Do.	118	377
*T. Hindley	Do. ...	132	335
*J. Ferguson	Chinese Langshans ...	115	331
Rev. A. McAllister	Black Orpingtons ...	125	321
Jas. Avery	Langshans	100	320
*A. E. Walters	Black Orpingtons ...	104	311
G. Muir	Do. ...	103	299
Jas. Ryan	Rhode Island Reds ...	96	297
*R. Burns	Black Orpingtons ...	120	277
*E. Stephenson	Do.	105	268
*C. C. Dennis	Do.	107	271
R. Holmes	Do.	96	264
*Parisian Poultry Farm	Do.	104	263
*E. F. Dennis	Do.	108	261
W. Becker	Langshans	83	252
*J. Cornwell	Black Orpingtons ...	99	239
*E. Morris	Do.	62	237
*H. M. Chaille	Do.	82	230
G. Cumming	Do.	98	226
*Mrs. G. Kettle	Do.	106	200
J. W. Newton	Do.	78	183
*A. Shanks	Do.	87	172
*N. A. Singer	Do.	104	161
*J. E. Smith	Do.	79	144
*E. Oakes	Do.	71	133
T. C. Hart	Do.	60	92
F. Harrington	Rhode Island Reds ...	53	90
Total	...	6,511	17,613

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	60	51	48	64	62	62	347
W. and G. W. Hindes	66	42	57	67	63	32	327
J. M. Manson	45	62	57	46	61	44	315
H. Fraser	60	46	54	42	57	50	309
C. M Pickering	62	53	45	42	62	42	306
H. C. Towers	55	43	51	41	52	61	303
Mrs. R. Hodge	51	61	57	50	61	22	302
J. Newton	50	59	58	40	55	34	296
W. Becker	46	56	42	41	68	9	262
T. Fanning	50	39	48	42	35	47	261
C. Goos	45	62	9	28	35	76	255
R. C. J. Turner	46	39	35	30	53	50	253
E. Chester	41	49	39	40	39	43	251
Thos. Taylor	32	51	38	22	31	59	233
E. A. Smith	62	34	39	27	31	32	225
S. L. Grenier	36	57	20	39	38	35	225
Mrs L. Anderson	30	44	39	40	42	28	223
Haden Poultry Farm	43	30	33	41	29	46	222
T. Eyre	33	34	26	41	46	42	222
G. Williams	69	41	24	22	28	32	216
B. Chester	26	25	52	32	50	28	213
W. and G. W. Hindes	29	20	22	57	28	53	209
H. P. Clarke	56	20	26	11	19	30	162
HEAVY BREEDS.							
T. Hindley	69	50	57	47	64	48	335
J. Ferguson	59	49	44	61	57	61	331
A. E. Walters	50	61	52	57	34	57	311
R. Burns	22	31	72	24	64	64	277
E. Stephenson	51	40	47	38	40	52	268
C. C. Dennis	58	42	26	53	47	45	271
R. Holmes	32	36	41	50	68	37	264
Parsian Poultry Farm	43	42	40	70	15	53	263
E. F. Dennis	24	53	40	42	38	64	261
J. Cornwell	43	15	44	50	44	43	239
E. Morris	33	51	13	61	40	39	237
H. Chaille	22	55	32	63	47	11	230
Mrs. G. Kettle	26	48	55	10	12	49	200
A. Shanks	9	32	16	35	41	39	172
N. A. Singer	25	16	28	30	14	48	161
J. E. Smith	55	51	24	12	2	0	144
E. Oakes	0	44	19	43	14	13	133

CUTHBERT POTTS,
Principal.

The Orchard.

THE CASSABA.

The cassaba has not yet come into its own in Queensland, though climate and conditions generally are favourable to its successful cultivation. In California it is grown extensively and very profitably. Quite distinct from ordinary rock or water melons, its delicious flavour makes it a very welcome addition to the menu. It is both nutritious and sustaining. In appearance it resembles a hard, heavy, wrinkled melon, and varies in weight, from 10 lb. to 20 lb. The vine is a vigorous grower, its foliage is larger than that of the rock melon, and it is very prolific. The fruit ripens late in autumn and keeps well into winter. If stored in a cool place it will keep much longer. When the soil is not rich it should be well worked and manured. Two

Plate 9.—Cassaba Melon.

or three seeds should be planted in each hill 12 ft. to 13 ft. apart. The soil should be kept loose around the plant until the vine begins to run, when it should be earthed up. The fruit should be taken from the vine when it has lost its green lustre, but should not be eaten until about a week after it turns yellow. Mr. H. W. Mobsby, of this Department, who introduced the fruit to Queensland from California a few years ago, has a limited quantity of seed for distribution. A small supply will be sent to anyone interested on receipt of a stamped and addressed envelope sent care of the Editor.

GREEN CROP MANURING.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Under the heading of "Intensive Cultivation" I drew attention in the July number of this journal to the very important and frequently unrecognised fact—that the application of commercial fertilisers to the soil is of little value to the crop growing on such soil unless it (the soil) contains sufficient moisture to dissolve the various available plant foods present in such fertilisers, and thus enable the plants which constitute the crop to absorb by means of their root systems the plant foods which are essential to their proper development. It was further pointed out that the capacity of a soil to retain moisture during dry periods depends to a very large extent on the amount of humus or vegetable matter it contains, and systematic green-crop manuring was recommended for soils that are deficient in this constituent.

In the present number it is, therefore, deemed advisable to follow up my remarks which appeared last month with a more detailed account of green-crop manuring, and the benefits to be derived from it, as it is a matter that few fruit and vegetable growers, not to mention agriculturists generally, realise the value and importance of.

The fact that many Queensland soils, especially those that have been under cultivation for some years, are deficient in humus, is shown by the large number of soil analyses that have been made by the Agricultural Chemist, in which the organic matter or humus is low, and in which the power to absorb and retain moisture is also low. Such soils are also usually low in nitrogen, and their capacity for nitrification is poor. This means that no matter how rich a soil is in other plant foods, such as phosphoric acid, potash, or lime, if it is deficient in nitrogen and does not possess the power to retain moisture, owing to a lack of humus, it cannot produce a maximum yield of either fruit, vegetable, or farm crops of any kind. Such a soil cannot make good use of any commercial fertilisers, except in seasons of good and regular rainfall, and even then, if the nitrogen contained in such fertilisers is in the form of organic nitrogen or ammonia, it cannot be made use of by the plant or tree until such time as it has undergone the process of nitrification and been converted into nitric acid, in which form it is readily assimilated. The absence of humus, as already stated, retards nitrification, hence a soil such as described can never be made to yield a maximum return until its deficiency in humus has been made good, and its power to absorb and retain moisture has been increased.

Virgin soils, both scrub and good forest, contain, as a rule, a fair supply of humus, and this, in conjunction with their undepleted supply of plant foods, frequently enables them to produce good crops for a few years, even when given very indifferent attention, and this is due, not only to their supply of available plant food, but to the fact that their friable nature and power to absorb and retain moisture is the result of their having a good supply of humus. As this becomes depleted, the soil becomes firmer and more compact, is less easy to work, and dries out much quicker, so that its yield rapidly decreases, and in extreme cases it is said to be worn out. This unsatisfactory condition of the soil is the result of bad farming; in other words, "improper treatment," whereby it has been depleted of its supply of available plant foods and organic matter, and as no attempt has been made to make good these losses by judicious manuring and thorough cultivation, it has become unproductive.

It is absurd to say that any of our soils are already worn out, and therefore valueless, as many soils that have become unproductive can be brought into a high state of fertility by proper manuring and cultivation.

In the older countries of the world, soils that have been under cultivation for many centuries are still producing good crops; in fact, in many instances the yield is steadily increasing as the result of good farming, which means the maintenance of the soil in a state of perfect tilth and high fertility; so that what has been done and is being done there can easily be done in Queensland if we will employ the same methods as they do.

In warm climates the supply of organic matter in the soil is apt to become more rapidly exhausted than in colder climates, so that there is a greater need to

keep our soils supplied with it, either by the addition of farmyard or other bulky manures rich in organic matter or by the growing of crops suitable for green manuring. Soils rich in oxide of iron also become rapidly depleted in organic matter, and that is one of the reasons why much of our best scrub land, of volcanic origin, though extremely fertile and friable at first, soon becomes much more compact, less easy to work, and less able to withstand a dry spell. Such soils require to be given a regular supply of organic matter to maintain their fertility; in fact, all soils that tend to set hard and dry out soon need treating in a similar manner.

The necessity for green-crop manuring being thus shown, the question arises: What are the best crops to be used for this purpose? Here again the question of soil and climate has to be taken into consideration, as crops that would be very suitable in the granite belt would not be a success in the coastal districts and *vice versâ*. The various crops suitable for green manuring must, therefore, be considered according to their adaptability to the climatic conditions under which they are to be grown, and this will necessitate a brief description of the various crops and the best methods of growing them.

In the first place, the most suitable plants for green manuring are those belonging to the natural order *Leguminosæ*, which includes all the members of the pea and bean families. The suitability of these plants is due, first to the fact that many varieties are very strong growers, producing a large quantity of leaves and stems, which, when added to the soil, either by allowing them to rot on the surface or by ploughing them under, materially increase its organic contents. Further, these plants have the power of obtaining nitrogen from the atmosphere and of storing it in their roots, leaves, and stems, so that when these decay the soil is enriched by their nitrogen contents. This is a very important consideration, as nitrogen is the most expensive essential plant food contained in any fertiliser, and if the soil can be kept supplied in nitrogen by green-crop manuring, then the bill for artificial fertilisers will be considerably decreased. In the late nineties I wrote several articles for this journal descriptive of a number of leguminous plants suitable for green-crop manuring, and including, amongst others, the velvet bean, pigeon-pea, narico beans of sorts (lablabs), Mauritius beans of sorts, small Mauritius beans (*Phaseolus*), cowpeas, and peas of many kinds. Fruitgrowers, however, did not then pay much attention to green-crop manuring, with the result that, with the exception of our sugar-growers, the growing of these plants has not been continued. When visiting Buderim Mountain recently, I saw a young banana plantation, planted with the white narico bean, which had entirely covered the ground and kept down all weed growth, thus saving the owner the cost of chipping the land, and providing a good supply of humus for the soil. A photograph taken by Mr. Mobsby, of this Department, and reproduced herewith, gives a good idea of the growth and of the value of this particular bean for manurial purposes. All the other legumes mentioned did well when tested, some, however, being much more luxuriant growers than others.

The poorest grower was the Black-eyed Susan cowpea, which, though valuable as a pulse, is of little value for manure.

The velvet bean, small and large Mauritius, and all lablabs did well, as did the pigeon-pea, though the latter, being of a more woody nature, takes longer to become incorporated with the soil. Of the cowpeas tested, the black was the strongest grower, and, therefore, most suitable for manure. All these legumes are suitable for coastal districts, and, in addition to them, such crops as broad-leafed Essex rape and white mustard, grown during the winter, are of considerable value.

All the strong-growing legumes should be given plenty of room, such as 18 inches to 2 feet apart in the row, and from 4 to 6 feet apart between the rows. If the soil is in want of manure, they should be given a dressing of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate, or finely ground island phosphate, rich in lime, as this will tend to promote a good growth, and when the green crop is turned under the manurial matter will still be in the soil ready to be made use of by the permanent crop.

The legumes mentioned can be planted in spring as soon as the soil becomes warm enough, but if the spring is a dry one they will make little growth and, further, they will prevent the working of the soil so necessary for conserving moisture. In most cases, therefore, it is better not to plant till the wet season, when they will come away rapidly and soon cover up the land, thus checking and, when their growth is strong, preventing weed growth. Planted at this time, they are not likely to exhaust the soil moisture; and the permanent crops, such as bananas, between which they are planted, will not be injured. The soils of the granite belt, where the majority of our deciduous fruits are produced, are frequently very deficient in humus and low in nitrogen, consequently green manuring is a very necessary operation. The crops most suitable for this purpose are the grey or partridge field pea, rape, mustard, and possibly *Trifolium incarnatum*, or crimson clover, which should thrive in this climate and produce a heavy crop in spring that could be ploughed under. All these crops should be sown in the autumn as soon as the fruit has been gathered; and, even though they may be trodden on during the

PLATE 10.—LABLAB BEAN.

Photo. Dept. Agriculture and Stock.]

PLATE 11.—PINEAPPLE-GROWING ON BEERBURRUM.

Packing, Loading for Rail, and Tallying the Soldiers' Pineapples for Market. Grown on the "State Farm," near Railway, Instructor Burnett in charge. The pines in picture averaged about 6 lb. each in weight. Beerburrum Mountain in the background.

pruning and spraying of the orchard, they will still produce a good quantity of organic matter and nitrogen. In the case of the granite soils of this district, the application of a good dressing of island phosphate, rich in lime, will be of great benefit to the green crop, and although the soil contains sufficient potash for slow-growing plants, such as fruit trees, the addition of 1 cwt. per acre of sulphate of potash to 4 or 5 cwt. of island phosphate will materially increase the yield of the green crop, and, as the manurial matter is not likely to be washed out of the soil, it will be available for the following crop of fruit, vegetables, or other crop that may be planted. In this area, green-crop manuring, combined with the application of slowly acting phosphate manures rich in lime is, in my opinion, the cheapest and best way of maintaining the fertility of the soil.

The growing of crops for green manuring is not necessarily confined to established orchards or plantations, but it is admirably adapted for improving and renovating land that has been kept too long under one kind of crop, and has become unproductive in consequence. Land of this nature should be thoroughly prepared by deep and intense cultivation, and be planted with a strong-growing legume which has been heavily manured as previously described, and when the crop has made its maximum growth it should be ploughed into the soil, which, once the green crop has become thoroughly incorporated with it, will be in a good heart to grow any crop.

ORANGE WINE.

With the advent of the orange harvest, numerous requests reach us from correspondents for directions as to how to make orange wine. We have already given some good recipes for making this beverage, but here is one we take from the Natal "Agricultural Journal," by one who every year makes this wine, and who finds a ready sale for it at 15s. per dozen:—

Cask of Orange Wine (30 gallon cask).—1,200 oranges at 1s. per 100, 12s.; 120 lb. of sugar, £1 5s. Skin the oranges and press the juice out. Soak the pulp in water for seven days, and frequently stir and press. Add the extract to the juice, pour the mixture into the cask. Pour boiling water on the sugar until all is reduced to a syrup, when it is added to the cask, and the vacant space is filled with hot water. When the temperature is lukewarm add a little yeast, and at the expiration of three weeks fermentation should be finished. During the three weeks of fermentation liquor must be added to the cask so that it remains full, for a quantity of sediment will bubble over. When there are no more bubbles, 2 oz. of isinglass should be dissolved in some of the warmed liquor and added to the cask. The bung may now be fastened down. The tap is put in 2 inches from the bottom of the front head. At the end of a month the contents should be ready for drawing off. The cost will be 1s. 3d. per gallon, or 2½d. per reputed quart bottle, and the drink will be in great request. If the liquor is to be kept for any length of time, 1 oz. of salicylic acid should be added at the same time as the isinglass. The salicylic acid will act as a preservative, and prevent the liquor turning sour; but the best means of preserving the contents is to keep the cask full.

ANOTHER METHOD.

Gather the fruit when ripe. Peel the oranges. Put into a vessel with the head out and a tap fitted near the bottom. Pour on boiling water to cover it. Mash the pulp with your hands, and then let the mass stand till the pulp rises to the top and forms a crust in three or four days. Then draw off the fluid into another vessel, and to every gallon add one pound of sugar. Mix well and put into a cask to work for a week or ten days, and throw off any remaining lees, keeping the cask well filled, especially at the commencement. When the working has ceased, bung it down. It may be bottled after six to twelve months.

Or:—Express all the juice of the oranges in a press; strain. To every gallon of juice add 1 lb. of sugar and half-a-pint of brandy. Pour into a cask, but do not bung until it has done working. Then bung it close for three months, and draw off into another cask. When it is fine, bottle and cork well.

Another recipe, taken from "Farm, Field, and Fireside."—Take half a chest (400) of Seville oranges, pare off the rinds, and put two-thirds of them into 6 gallons of water for 24 hours. Squeeze the oranges through a sieve into a pan, and then throw them into another 6 gallons more of water; and leave them there until the next day. For every gallon of wine, put into the cask 3½lb. of loaf sugar, and the liquor strained clear from the rinds and the pulp. Repeatedly wash these, if more liquor should be required to fill up the cask, rather than add raw water. Stir the wine daily until the sugar is completely dissolved, and allow it to ferment for about five weeks. Add three bottles of brandy, stop down, and after twelve months bottle.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

COLVILLEA RACEMOSA.

Natural Order Leguminosæ.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(From "Botanical Magazine," f. 3325.) This truly splendid plant, bearing the name of the late Sir Charles Colville, a former Governor of Mauritius, to whom it was dedicated by its discoverer, is probably a native of the east coast of Africa; but was only seen by Professor Bojer in 1824, in the Bay of Bombatoe, on the western coast of Madagascar, where a single specimen tree was cultivated by the inhabitants. That great naturalist obtained seeds, which he took to Mauritius, where plants were raised and did remarkably well. Its flowering season in Mauritius is April and May; this is approximately its flowering time in Brisbane also.

Description.—Tree 40 to 50 ft. high, somewhat like the *Poinciana regia,* to which it is closely allied, but with a more decided trunk and rather heavier foliage; the bark is reddish-grey, branches long and spreading, the younger ones greenish, rough, with elevated points, this being one of the noticeable differences from the Poinciana, whose branches are tipped light-green and have a pendulous or drooping habit.

Leaves dipinnate, with from twenty to thirty pairs, oblong-oval in their circumference, 2 to 3 ft. long; pinnæ opposite, from 4 to 6 in. long, with twenty to thirty pairs of horizontal leaflets, ½ in. long, shorter at the base and at the extremity of the pinnæ, rather unequal, on very short petioles, slightly pubescent. The common petiole is swollen at the base, channelled above, also pubescent; this latter provides the whole petiole with a dull-brownish tint, contrasting with the bright green of that of the *Poinciana regia;* the leaflets also being slightly larger gives the heavier appearance.

Flowers bright orange-red, racemose; racemes from four to sixteen in a large terminal panicle from 12 to 18 in. long, borne on extreme end of branches. The buds are obliquely globose, velvety red; calyx greenish within, including the wings and keel; this latter is small, convolute, almost covered by the wings, and is of a yellowish colour, marked with veins. The ten free stamens are also of a yellowish colour.

Pod from 7 to 9 in. in length, from 2 to 2½ in. in breadth, carrying from six to nine seeds, the whole resembling the *Poinciana regia* pod, but on a much smaller scale.

The great weight of the racemes of flower, being on extremities, bend the branches down during the flowering season. This gives them a graceful appearance, and its striking colour attracts universal attention.

A fine specimen, near the Botanic Museum building, flowered recently and brought the remark from a visitor, Professor E. H. Wilson, Arnold Arboretum, Harvard University, U.S.A., "that is was worth coming all the way from America to see."

Propagation.—Unfortunately, unlike the *Poinciana regia* that flowers in summer, the *Colvillea,* flowering as it does in late autumn, does not produce seed owing to the cold weather intervening. Two years ago a number of pods set, but unfortunately fell off while immature. The difficulty of obtaining seed accounts for the rarity of the tree in Queensland. There are two good specimens in the Botanic Gardens, a medium-sized one in Edward street, at the corner of Margaret street, in front of the Harbours and Rivers Department building, and a small one in Bowen Park. We

PLATE 12.—COLVILLEA RACEMOSA.
Flowers bright orange-red. The branch figured was about 3 ft. 6 in. long.

are endeavouring to get seeds from abroad with the hope of raising a few plants for distribution to our Northern botanic gardens, such as Rockhampton and Townsville, where, if the tree grows, it should set seed readily, thus ensuring a supply for local gardens.

Professor M. Bojer, who named *Colvillea racemosa*, was Professor of Botany at the Royal College of St. Louis, Mauritius. He published a "Flora of the Mauritius" in 1837. It was during a visit to Madagascar that he discovered and named both *Colvillea racemosa* and *Poinciana regia*.

HORTICULTURAL NOTES.

This has been rather an exceptional season, and winter's cold is not yet in evidence. Showery weather continuing through June and July has given a remarkable growth of vegetation for this time of the year. Grass is needing more attention than usual, and weeds are troublesome. The cold necessary for the checking of insect pests and the growth of winter annuals is late in coming. This has particularly affected the growth of sweet peas, stocks, and phlox, besides others, more especially on undrained soils or low-lying situations, by making the soil sour. This can be improved to some extent by keeping the surface well stirred and not allowing it to cake.

The pruning of shrubs and creepers should now receive attention. Prune hard *Lagerstræmias* (Brugmansia and Poinsettia), the latter after they have dropped their red bracts. Hibiscus and ligustrums can be pruned lightly, but this depends to some extent on the room available and the size of plant desired. Acalyphas also may be pruned, remembering that if they are pruned hard it induces a lot of strong growth that is not always as nicely coloured as that not quite so robust. Wistarias also are much improved by pruning, more flower being obtained. This applies, too, to *Antigonon leptopus*, better and more abundant blooms being obtained if most of the small growth is removed and the main stems and laterals are tied in the direction desired.

Cuttings of shrubs and climbers may now be planted; get good medium wood. If hedges are required, now is a good time to plant. The small red acalypha, *A. compacta*, is very suitable for small garden hedges; put the cuttings in permanent position about 18 in. apart.

Bulbs of hippeastrum, crinum, and plants of agapanthus and clivias may be lifted and replanted if necessary.

Plant cuttings of begonias, coleus, and iresine; coleus seed, also aster and other summer-flowering annuals such as amaranthus, cockscombs, celosia, cosmos, annual chrysanthemum, coreopsis, calliopsis, marigold, and portulacca.

PNEUMATIC GRAIN UNLOADERS.

Pneumatic plants for discharging grain from ships have come largely into use during recent years on account of the saving in manual labour for handling and trimming, and also because of the comparative absence of dust. During the war a number of self-contained floating grain plants were supplied by a British firm to the French Government to handle the increased imports of grain necessary owing to the reduction of agriculture in France. The same firm recently constructed a similar floating plant with the large capacity of 180 tons per hour. It is a combination of pneumatic and band conveyors for simultaneously discharging from a grain ship through spouts to lighters and by means of the band conveyor across the deck of the ship to bands below the quay. The plant is erected on a pontoon which is brought alongside the ship to be emptied. Although designed for 180 tons per hour, this equipment proved able, on a recent test, to discharge at the rate of 200 tons per hour, the highest capacity being 216 tons per hour for two consecutive hours.

Tropical Industries.

THE CANE CROP.

FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (8th July, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

In the course of the month the districts of Bingera, Gin Gin, and Childers have been visited; also Goodwood and Dallarnil. At Bingera, the cane looks promising. The plant and ratoon crops are both well grown and healthy. Young autumn plant cane has struck strongly. Cane pests appear to be well under control, especially the moth-borer. The fact is due, probably, to the large numbers of ants found in the canefields, which are, apparently, their most effective natural enemy. Grubs are also well under control. This may be due to the fact that they are living on organic matter in the soil and leaving the cane roots alone (although not many grubs are found) or that bacterial agencies are destroying them. The cane this year is very suitable in most cases for plants. There are occasional blocks, however, which display unhealthy characteristics. These should be avoided by the farmer as far as planting is involved, and only cane displaying the best appearance should be selected. The leaf-hopper is everywhere present, although apparently well under control.

The darker soil could be limed. More green manuring is essential, especially before using chemical fertilisers. In ploughing-in green crops, the growers should get to work before the seed ripens and when they have the greatest mass of green crops on the field. This restores to the soil the maximum amount of nitrogen and humus the crop can supply.

At Gin Gin the cane crops are excellent. Since the hurricane the cane has made wonderful growth. The growers are greatly heartened, and speak confidently of this season and the likelihood of a good one in 1922.

No disease of consequence is apparent. The effect of the drought is still noticeable in the leaf of the older crops, but this must not be confused by the grower with striped-leaf disease. Pests are also well under control, either by active farming or natural enemies. The moth-borer is attacking the cane in places, but is here again checked by the ants. Taking the district as it is now, the briefest mention need be made of cane pests.

The two most satisfactory varieties are D. 1135 and M. 1900. Both will cut heavily this year, and, judging by the sugar content at Show time, should yield a high percentage of c.c.s.

Farmers, at the time of visiting, were busy breaking up land prior to the spring planting. Should the winter be as mild as anticipated, they ought to be able to plant by the end of July.

At Childers the cane has made heavy growth in the last three months, and some of the twenty-months-old D. 1155 will cut 60 tons to the acre. The cultivation is very good here this year, and the farms are free of weeds. The autumn plant crop has struck well, even misses supplied as late as June coming up vigorously.

D. 1135 and M. 1900 Seedling are the principal canes grown. Others that present a good appearance are H.Q. 77, M. 87, Q. 813, Rappoe, Striped Singapore, and H.Q. 285. Of the newly distributed varieties, E.K. 1, E.K. 28, and Shahjahanpur No. 10 have struck well and are growing vigorously, and are absolutely free from disease. Growers want to bear in mind that the Experiment Stations will not send out cane that is diseased or unsuitable for planting.

Q. 813, another station cane, is doing well, and should be grown by farmers. This variety is a highly resistant cane to disease, and suitable to follow up unsatisfactory crops of D. 1135.

Very little trouble is being caused by cane diseases. An occasional trace of striped leaf disease is evident; also gumming, but there is nothing of an extensive nature.

Peculiarly enough, D. 1135, while a good drought-resister and resistant to grub attack up to a certain point, is a susceptible variety as far as sugarcane diseases are concerned.

This might be on account of the degeneracy of the cane caused by years of careless selection of plants and neglect to change from one soil to another in obtaining supplies of cane for planting.

It should be impressed upon the grower that, whatever cane he prefers to plant, it is essential to select the best type of that variety.

Cane pests are well under control this year. Grubs have destroyed small patches of cane, but the damage is nowhere extensive. Other insect parasites, such as leaf hopper and borer, are doing very little damage. It is worth mentioning that what is thought to be the Muscardine fungus is attacking the grub and causing a high percentage of mortality in the infected areas. A bacterial disease is also in evidence, but the percentages of deaths and the character of the attack could not be observed.

While in the Childers district, a visit was made to Goodwood Plantation, and also to Dallarnil. Very little cane is grown at the latter place, but the soil is suitable if the rain favours the grower. However, several farmers are making efforts to raise crops of sugarcane, and, judging by the appearance of some fields, they have every reason to feel satisfied.

Varieties such as D. 1135, Rappoe, and Striped Singapore are doing well.

Goodwood presents a fine appearance at the present time; in fact, the cane here is equally as good as at Childers. Noxious weeds are not present in any serious growth, while very little trouble is being caused by pests. The land is remarkably free, apparently, from these.

Of the different varieties growing, those displaying the best characteristics include Petit Senneville (a Mauritius variety), Clark's Seedling, D. 1135, H.Q. 77, Black Innis, and M. 1900 Seedling. Green manures could be profitably applied by growers.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. Easterby, states, in the course of a report dated 6th July, 1921, on a recent visit to the Mackay and Bundaberg sugar districts, that since his previous visit the cane had made good progress in each locality, but the Mackay cane was flowering or "arrowing" very largely, and hence little more growth could be hoped for. Not much flowering was observable in the Bundaberg district where the cane, due to the favourable weather conditions, is still making progress.

At Mackay heavy rain fell, ranging from 5½ to 11 inches, in different parts of the district. Unfortunately, this was accompanied by a severe gale, which laid a good deal of the high cane over, and in some instances flattened it considerably. The weather at Mackay has, in common with most other districts, been very much warmer during the past three months than for the corresponding period of 1920. Some of the mills intended to start crushing in July, while the remainder will start early in August.

The Annual Field Day of the Mackay Experiment Station was held on Saturday, 2nd July, and it proved a very great success. About 250 farmers attended, and these were shown over the station grounds, and the various experiments in cultivation and fertilising were explained. The merits and demerits of a large number of varieties imported from different parts of the world were discussed and arrangements made for supplying cane farmers with free parcels of the best kinds. After luncheon, the General Superintendent delivered an address upon the necessity for increasing our sugar production, and the best methods of achieving this were fully set forth. The demonstration of improved farm implements, owing to the wet nature of the ground from the heavy rain, had to be reluctantly abandoned, but one or two of the lighter tillage implements were shown in action. Farmers were intensely interested in the day's proceedings, and acknowledged having spent a pleasant and instructive time.

At Bundaberg, two of the mills had already started crushing operations.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 14th July, 1921:—

Babinda.—In last month's notes I omitted to mention that among the varieties grown in the district, D. 1135 has to be included. This cane has mostly been grown in grubby areas, and so far has proved its value, showing up remarkably green and healthy in comparison to other varieties that are more badly affected by the ravages of grubs. A larger area of this useful cane is sure to be planted if the grubs continue to do damage.

On the newer portions of this district visited, some magnificent Badila cane was found on the block formerly known as the Q. N. Bank Estate, situated on the south side of the Russell River. A block of 37 acres of plant cane growing there will cut between 50 and 60 tons to the acre. Some of the first ratoons on this block are also very forward. This particular part of the area carries a rich deep alluvial soil formerly under dense tropical scrub. In visiting this district one cannot help noticing how very much it has grown lately. Large areas of land are being grubbed and ploughed in every direction, and the general air of prosperity is very marked. New homes are being erected everywhere.

CAIRNS DISTRICT.—In this district, Freshwater now comprises the areas formerly known as Redlynch and Smithfield, and consists of deep, rich, dark-red volcanic soils and magnificent alluvial flats adjacent to the Barron River and Freshwater Creek. Most of it has not been under crop for a number of years, and in the interval has been growing heavy crops of lantana, blady grass, or burrs. When cleared and ploughed, its possibilities for canegrowing become evident.

On the northern side of the Barron large areas are now being prepared for cane. A great deal of work has been done in building a temporary low-level bridge over the river, and supplementing the mill supply of rails by about a mile of private tramline composed of 3 in. by 3 in. wooden (Pender) rails. Large areas are being planted. Further up Freshwater Creek the same evidences of activity are to be observed in all directions, and 1922 should mark a great increase in prosperity for this rich area.

Redlynch and Freshwater are now very busy places, and old residents begin to think that at last the rich lands of this locality will be able to show what they are capable of producing in the way of sugarcane. Very few grubs were noticed in this particular part of the area, and the cane seed (practically all Badila) looks very green and healthy.

ALCOMBA AND GORDONVALE.—These districts are now in full swing harvesting their crops. Badila composes about 90 per cent. of the cane grown, with about 4 per cent. each of D. 1135 and H.Q. 426; whilst the Gorus 24, 24 A, and 24 B, and 1900 Seedling account for the other 2 per cent. Quite a number of growers who have suffered from grubs this year expressed their intention of planting a larger area of D. 1135 this planting, as they are satisfied that it stands up to the grubs better than any of the other areas.

Some of the cane now being harvested is being sent in to the mill in anything but a clean state, trash and tops being very noticeable.

Owing to the floods earlier in the year, and, later on, to the grubs, the tonnage of the two local mills will be considerably below the original estimates. The shortage from these causes will probably be in the vicinity of 45,000 tons for the two mills. Grubs have caused damage to farms previously free from them. It is considered by some farmers that, had the beetle and grub fund been kept in constant operation all over the district, damage this season would, probably, not have been so severe. In support of this assumption, Mr. Scanlon, near White Rock, tells me that he picked up all the grubs on one block after each successive ploughing. This and the adjoining area were all planted with Badila at about the same time, but whilst all of it shows the presence of grubs, this particular block did not fall down until much later than the others, and has most certainly suffered far less. Apart from the damaged stuff, some splendid fields of cane are to be seen all over the district, and some very heavy yields per acre will be cut this season. At time of writing, several days' rain had been experienced. This fall will help the recently planted cane along nicely, and also keep the grubby cane alive. Quite a large number of tractors are in use in this district, and are credited with doing very good work. Liming, green manuring, and artificial fertilising are being very freely carried out.

MOSSMAN DISTRICT.—When this district was visited, wet conditions prevailed. The rain ceased before the commencement of the crushing. The cane generally looks very green, but might be more advanced.

The cane grown, and the proportion of the same to the total crop to be harvested should, approximately, be as follows:—

Badila	19 per cent.
H.Q. 426	22 per cent.
D. 1135	42 per cent.
Others	17 per cent.
	100 per cent.

By these figures it will be seen that D. 1135 is the most popular variety of cane grown, and some good crops are often harvested here. The crops listed as under were cut on one particular block in the vicinity of the mills:—

Standover Plant	56 tons per acre
1st Ratoons	31 tons per acre
2nd Ratoons	27 tons per acre
3rd Ratoons	25 tons per acre
4th Ratoons	20 tons per acre

while the crop now being harvested promises a 25-ton yield.

Badila and H.Q. 426 are not doing too well, on the whole, although in some places good crops of these varieties are standing.

Of the Gorus, some very fair 24 B may be seen. Of other varieties, Messrs. Crees Bros. planted some twenty new kinds last year upon medium-quality land liable to flood. During the early part of the year flood waters considerably damaged this block, several varieties being quite spoilt. Of the varieties that suffered least, M.Q. 1 and M.Q. 5 (Mowbray seedlings) are doing by far the best, showing a good length of cane, a fair number of sticks, and a splendid green top. H.Q. 903 has also grown very well here, but Q. 813 and Q. 855 have not done so well. All through the district grubs are to be found in places, but cannot be classed as bad, on an average of the whole crop.

Soils consist mainly of a greyish to brown alluvial, varying considerably in depth and covering in most places a stiffish clayey subsoil, and in others a sandy subsoil. A very strong acid reaction is noticed in the soil samples taken. This is due to the continued growth of cane upon the same land, and also helped by the use of artificial fertilisers, such as sulphate of ammonia. Meatworks manure and sulphate of ammonia are at present the principal manures in use in this area. The use of lime would be of much advantage to these soils, but, unfortunately, its cost has so far made its general use prohibitive. Green manuring in the shape of Mauritius beans and cowpeas is giving very good results.

Taking the district as a whole, a large area of very fair land is still available for growing cane, and, as the mill has suffered from a shortage for a number of years, it is a great pity that this land is not being utilised.

After finishing the Mossman district proper, a day was spent at the 7-Mile on "Mowbray." Some very good deep alluvial soil is found adjacent to the river and creeks. Very heavy crops of 24 B and Badila were observed. On Mr. Robin's farm some of the local seedlings are showing very good growth, notably No. 1 Mowbray Seedling, which, although planted at the end of last November, carried some 8 ft. of cane, and should easily cut a 40-ton crop.

CANE ARROWING.

By H. T. EASTERBY, General Superintendent, Sugar Bureau.

The condition which produces what, after all, is but the natural functioning of the cane plant—namely, arrowing, flowering, tasselling, or spearing, as it is variously termed—is not yet generally understood, but it is mostly attributed to climatic factors. On very poor soils, arrowing is frequently common, but this does not apply to the large percentage of arrowing which is taking place this year. In the hotter cane areas, such as Java, Cuba, Hawaii, and North Queensland, arrowing is more or less universal, and as a large production of sugar takes place in these countries, arrowing is accepted as the common thing, and little or no comment is made on the matter. In Mackay and the Southern cane areas the arrows usually take a much longer time to mature, *i.e.*, to become "fluffy" and blow away with the wind, and this is a good point in one way, as it takes the cane longer to mature, but it is a great obstacle in trying to raise seed from the arrow. For many years, endeavours were made at the Mackay Sugar Experiment Station to raise seed from cane, but the arows took too long to ripen, and the arrows from the different varieties of cane did not all ripen at the one time, so that cross-fertilisation could not take place. About Cairns, where the arrows mature quickly, seedling work has been carried out with great success.

Experiments carried out in Hawaii many years ago showed that arrowed cane did not lose its sugar content, provided it was crushed as rapidly as possible. It has been further argued that arrowed cane did not make good plants, but experiments carried out at the Sugar Experiment Station at Mackay, using arrowed and non-arrowed plants of the same variety and age, actually gave a slight yield in favour of the arrowed plants in both the plant and first ratoon crops. As more sugar is extracted in the Ingham-Mourilyan district (where arrowing is usual) from a lower

tonnage of cane than anywhere else in Queensland, except the Lower Burdekin, the arrowing conditions need not be greatly feared. If there should be any decrease in the average sugar contents of the cane this year, it is far more likely to be due to the great amount of rain experienced so late in the season than to arrowing conditions.

Noel Deerr, in his work on "Cane Sugar," says:—

"Arrowing marks the end of the vegetative period of the growing cane. It has been thought that arrowing had an influence on the sugar content of the cane; definite experiments by Harrison and by Prinsen Geerligs have shown that this belief is unfounded. After the cane has arrowed, no further formation of sugar takes place, but an elaboration of that already formed obtains, with an increase in the cane-sugar content and in the purity; eventually, however, the cane dies down, and then a breaking down of the cane sugar occurs. The time to which cane can be left standing after arrowing is very variable, and is dependent on variety and climate. In the Hawaiian Islands, cane may remain as long as six months after arrowing, before deterioration sets in."

THE ALGAROBA TREE IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Instructor in Agriculture.

The contribution appearing in the June issue of the Journal, by Mr. C. T. White, F.L.S., Government Botanist, on the Algaroba Bean, will no doubt be an incentive for many to plant this useful tree.

The writer, as far back as 1900, pointed out its value as a fodder through the medium of the Journal. The results following that article were rather surprising, for in a very short time over 300 applications for seed came to hand. Although those requests were complied with, the results accruing from the seed distributed have been disappointing. So far, I have not seen any trees in the districts adjacent to the coast that have been raised from seed sent out at that time. From reports received, the failures in most instances were due to the difficulties experienced in germinating the seed. Quite a number stated that their plants died when transplanted.

As a result of a later distribution of Algaroba seed, trees are to be found in several localities throughout Central Queensland. Mr. E. Brotherton, Gladstone, has a tree in bearing, seeds of which have been advertised for sale in the Journal. There are several trees growing on the property of Mr. Hugo Tooker, Cawarral, Yeppoon Line, one of which bore its first crop last season. Mr. M. E. Huntly, Mount Larcom, has also two trees about seven years old. They have produced two heavy crops of beans.

Some nine months ago, Mr. Huntly very kindly supplied me with a quantity of seed, which I distributed, with instructions to soak in boiling water before planting. From information received, seed treated in this manner gave good germination, while untreated seed had so far given negative results.

Judging by the rapid growth made by the trees in the districts mentioned, together with their heavy cropping qualities when in bearing, conditions in Central Queensland are eminently favourable for the raising of the Algaroba Bean.

BANANA PLANT FIBRE.

The commercial possibilities of banana plant fibre has engaged the attention of planters and others interested from time to time, and some Tweed River growers have had under consideration the formation of a syndicate to thoroughly explore those possibilities.

A number of banana-fibre products have been submitted to our inspection, and as samples they appeared to be all that could be desired. A textile product woven from processed fibre had a fine silky appearance, and its value as a possible substitute

PLATE 13.—ALGAROBA BEAN, BOTANIC GARDENS, BRISBANE.

Photo. Dept. Agriculture and Stock.]

for panama hat material was suggested. Another possibility is the production of vegetable silk from the residue of the treated material after the fibre has been extracted.

The question of the value of fibre from the stem of the banana is a recurring one, and should be approached with all due caution. In the West Indies many years ago, Sir D. Morris, D.Sc., D.C.L., F.L.S., Director of Public Gardens and Plantations, Jamaica, devoted close attention to it. One of his successors, William Fawcett, B.Sc., F.L.S., in his work, "The Banana: Its Cultivation, Distribution, and Commercial Uses" (1913), p. 151, says—

"The stem (banana) yields less than 1½ per cent. of its weight; that is, about 1¾ lb. per ordinary stem as cut. . . . To obtain 1 ton of fibre it would therefore be necessary to handle nearly 100 tons of fresh stems, which must be dealt with as soon as cut, on the spot. . . . It is considered that the value, as manure, of the chopped stem is perhaps two or three times the value of the fibre. No reasonable person would wish to export fibre to the detriment of his land. . . . The banana and plantain are grown primarily for the fruit, and not for fibre.

"In 1905, when the subject was under discussion, Sir D. Morris sent the following communication to the Jamaica Agricultural Society (Jour. Jam. Ag. Soc., X. 2, 1906):—'I enclose a summary of the facts obtained as the result of experiments during the last twenty years. They are as follow:—A banana stem just after fruiting, if cut, as usual with the country people, about 2 ft. above ground, and denuded of its foliage, weighed 108 lb.; this being divided into three lengths of 2½ ft. each, and split longitudinally into several pieces, was prepared by beating and washing by hand, and yielded 25 oz. of clean marketable fibre, which is at the rate of 1.44 per cent. of the gross weight. The fibre of the lower portion of the stem, as also the fibre in the petioles of the leaves, was not extracted.

"'A smaller banana, cut under similar circumstances . . . weighed 41 lb. This was divided into two lengths of 2½ ft. each, and, after being split longitudinally into several pieces, was prepared by hand, and yielded 6¾ oz. of clean fibre, or at the rate of 1.02 per cent. on the gross weight.

"'At the Hope Plantation, similar experiments were conducted with banana stems, which yielded very much the same results. Two banana stems, cut after fruiting at 2 ft. from the ground, and denuded of their leaves, weighed 147 lb. These yielded 33 oz. of clean fibre, or at the rate of 1.44 per cent. on the gross weight.

"'From ordinary stems of banana, cut after fruiting at about 1½ to 2 ft. above ground, a settler might prepare about 1½ lb. of clean fibre; but if the stems are large, and the whole of the length is used as well as the petioles of the leaves, the amount of the fibre might be increased to 2½ lb., if not 3 lb., per stem. . . .

"'It must be borne in mind that to obtain 1 ton of banana fibre it will be necessary to handle nearly 100 tons of fresh stems. These cannot be carried to a central place for treatment, as the cost of the fibre would be increased beyond its market value. The stems will be required to be dealt with on the spot. . . .'"

SUCCESSFUL BRITISH TRACTORS.

The merits of the British-made tractor for agricultural purposes were conclusively demonstrated during a trial on a rubber estate in the Far East. All conditions were against success. The soil consisted of heavy sand or of sand mixed with clay, and rain had fallen heavily prior to the trial. Nevertheless, the driver was able to turn and manœuvre with the greatest ease. Further, the tractor showed its hauling powers by pulling two large trucks, weighing about 11 tons, up hill.

STORING APPLES IN GAS.

In storing apples there is a very interesting alternative to cold storage, known as "gas storage." The apples are placed in an airtight chamber filled with the gas produced by the respiration of the apples themselves. An electrical instrument is used to determine whether at any time the proportion of carbon dioxide in this gas becomes excessive, and when that condition occurs air is admitted to dilute the gas. The air is kept in slow circulation by its own temperature variations, and means are taken to remove excess of moisture. It is stated that this system doubles the time during which apples can be kept in good condition, and that the cost of working is very much below that of any kind of cold storage. The merits of the system are being closely studied by the British Investigation Board.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 22.

INDIAN HELIOTROPE (*HELIOTROPIUM INDICUM*, Linn.).

Description.—An annual herbaceous weed. 1-3 ft. high, more or less hairy or the older parts glabrous. Leaves ovate, oblique at the base, blade 1½-3 in. long tapering into a leaf-stalk of ½-1½ in., the leaf-stalk and often the main nerves sprinkled with longish white hairs. Flowering spikes terminal or placed opposite the insertion of a leaf, up to 1 ft. long, the upper part coiled or curved. Flowers numerous, closely packed on one side of the spike, white or bluish. Fruit, consisting of 4 small beaked nutlets, arranged in the form of a mitre, at first separating into pairs and later singly. Single nutlets ("seeds") 1½-2 lines long.

Distribution.—It is a common plant over the tropics of the world. In Australia it would seem to have been introduced. In his "Second Census of Australian Plants," Baron von Mueller records it for Queensland and the Northern Territory. Of late years it has become very abundant about Rockhampton, and has the appearance of having been introduced there. It has also recently put in an appearance about Bowen, and, according to a correspondent (Rev. N. Michael), it appears to have been accidentally introduced there.

Botanical Name.—Heliotropium, from the Greek *helios*, the sun, and *trope*, a turning, from the belief that the flowers are always turned towards the sun; *indicum*, Latin, meaning Indian.

Uses.—W. Dymock, in his "Vegetable Materia Medica of India," states:—"The plant appears to be generally used as a vulnerary in different parts of the world. Of its medicinal properties, Ainslie states:—'The juice of the leaves of this plant, which is a little bitter, the native practitioners apply to painful gumboils and to repel pimples on the face; it is also prescribed as an external application to that species of ophthalmia in which the tarsus is inflamed or excoriated.'" In Bombay the plant is used as a local application to boils, sores, and the stings of insects and reptiles.

Eradication.—So far it has not asserted itself as a particularly aggressive weed, and eradication by hand-pulling or hoe-chipping should not be difficult. As the plant is an annual, this should be attempted, if possible, before it has had time to ripen any seeds.

NOTES ON SOME NORTH QUEENSLAND WEEDS, Etc.

Writing to the Government Botanist, the Northern Instructor in Agriculture (Mr. N. A. R. Pollock) supplies the following interesting notes about some Northern plants:—

Leucas zeylanica is plentiful in parts of North Queensland; it is eaten greedily by all kinds of stock, and is not looked upon in any way as a pest.

Hyptis suaveolens, or Bell Weed, is a bad pest, and spreads freely. It grows in parts in dense masses to over 6 ft. in height. Nothing seems to touch it except cockatoos, which feed freely on the ripe seeds. The story is that a Chinaman in Cooktown brought it out and grew some in his garden for medicinal purposes. It is such a pest here that its introduction elsewhere needs guarding against.

Both the above plants were figured and described in this Journal for September, 1919.

Rhynchosia australis.—I find stock relish this leguminous vine when it is fairly dry, and I have noticed a cow with about 20 ft. of vine trailing after her and gradually chewing it up until none remained. Legumes in a wild state that stock eat should make available additions to our pastures.

Stylosanthes mucronata, the "Wild Lucerne" of the Townsville district. I have this plant under trial in all my districts as far out as Burketown, where it is reported to be doing well. It is proving of immense value on the North Queensland coast, as a mixture in pasturage, but, unfortunately, appears to be of annual habit; a perennial would be worth a good deal more. A figure of this plant will be found in this Journal for August, 1913.

Plate 14.—Indian Heliotrope (*Heliotropium indicum*)

A. Shoot bearing leaves and seeding spikes. B. Nutlets ("seeds").
C. Portion of flowering spike (slightly enlarged). D. Group of four nutlets or "seeds." much enlarged. (A and B reduced to scale).

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 5.

BLUE BERRY ASH (*ELÆOCARPUS OBOVATUS*).

Common Name.—Blue Berry Ash.

Derivation.—Gk. *elaia,* the olive tree; *karpos,* fruit; obovate from Lat. *obovatus,* reversed egg-shaped (in allusion to the shape of the leaf).

Description.—A tree attaining 120 ft. in height and a barrel diameter of over 3 ft. Barrel often widely flanged at the base. Bark grey, slightly rough but not scaly; when cut, brown, yellow towards sapwood, ¾ in. thick on a tree with a barrel diameter of 3 ft. Surface of sapwood pale yellow; sapwood white when cut. After several hours' exposure, the inner surface of the bark and the surface of the sapwood sometimes turn a greenish black colour. Leaf stalks ⅛-¼ in. long. Leaves alternate, elliptical or narrowly elliptical, often broader towards the apex, rounded or with a blunt point at the apex, mostly gradually narrowed into the stalk, margins often toothed, teeth often distant; leaf blade measurement 2 to 3½ in. in length, twice to thrice as long as broad. Flowers in rather narrow racemes springing from the forks of the leaves or from the scars of fallen leaves, the racemes about as long as the leaves. Stalks of individual flowers from $\frac{1}{16}$ to ⅛ in. long. Individual flowers about ⅛ in. long. The outer part of the flower, the calyx, is composed of 5 pointed lobes about the length of the flower. Inserted on the inside of and between the calyx lobes, and about as long as them, are the 5 petals, each of which is split into 6 or 7 narrow teeth at the apex. On the inside of the petals, and shorter than them, are the bristle-like stamens, over 15 in number, surrounding the central, small, egg-shaped ovary. Fruit oval or globular, blue, about ½ in. long, outer part almost succulent, surrounding a rough tuberculate stone which mostly contains a single seed.

Flowering Period.—September.

Distribution.—Confined to Australia. Coastal scrubs of Queensland from the Southern border to Mount Perry (west of Bundaberg and about 60 miles from the coast). New South Wales as far south as Port Jackson (C. Moore).

Uses.—The timber should be useful for indoor work such as fittings and cabinet-making.

References.—Elæocarpus obovatus, G. Don, in "General History of the Dichlamydeous Plants." Vol. I., p. 55; Bentham, "Flora Australiensis," Vol. I., p. 281; F. M. Bailey, "Queensland Flora." Part I., p. 163.

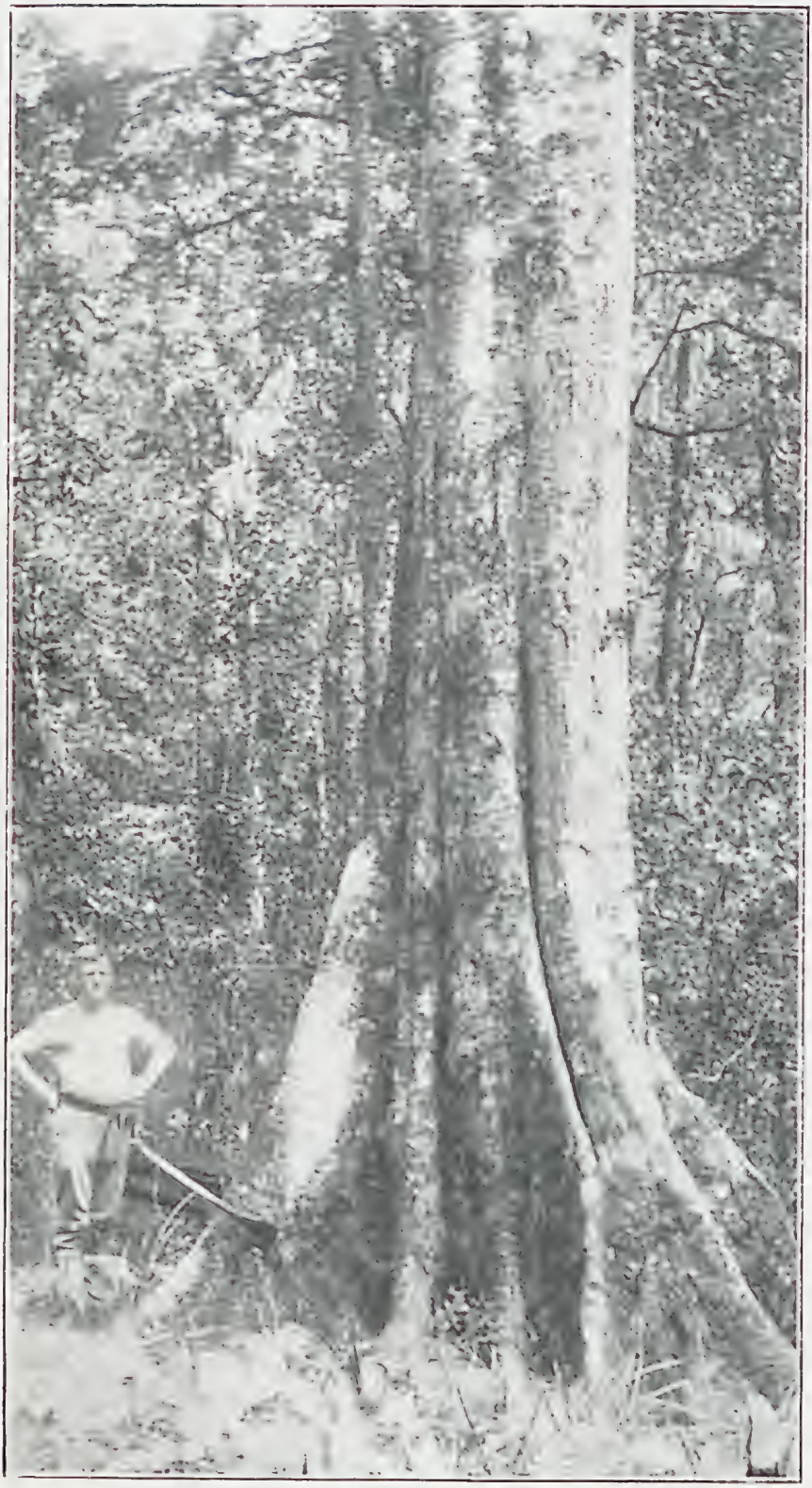


Photo. by the Authors.]

PLATE 15.—BLUE BERRY ASH (*Elæocarpus obovatus*).
Ranges eastward of Emu Vale, Killarney District.

Photo. by Dept. of Agriculture and Stock.]

Plate 16.—Blue Berry Ash (*Elæocarpus obovatus*). Natural Size.
Reading from left to right—Flowering branchlet, fruiting branchlet, seed, and leaf.

Entomology.

GRUBS IN THE CAIRNS DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon cane grub investigations from the Entomologist, Mr. Edmund Jarvis:—

When given charge of this entomological laboratory on the 19th of last month, I naturally endeavoured in the first place to review the cane-grub situation from an economic standpoint, and to summarise as far as possible the results of various activities of this station during the years 1918 to 1921.

Although climatic conditions have been very favourable to the growth of cane, the outlook is anything but encouraging, grubs having appeared in numbers this season at Mulgrave, Highleigh, Hambledon, and elsewhere, on river-flats and places which have for many years past been free from attack; while at Greenhills, that stronghold of the "grub pest," about 300 acres of cane are badly affected.

Such widely spread injury, occurring as it does at a time when the beetles during the last three years have not been collected, and had a chance to breed and multiply a hundredfold, must appear significant.

As a matter of fact, economic entomologists the world over have long recognised the importance of systematically collecting the grubs of many injurious species of root-eating scarabaeidæ.

For instance, in a recent Bulletin (1918) issued by one of the sugar experiment stations of Porto Rico, we read:—"The most successful method of controlling the white grub that has yet been found is that of collecting the grubs and beetles. The method is rather expensive, but it is the only sure way of keeping the pest from increasing." Again, our State Entomologist, Mr. H. Tryon, at a meeting of the Australian Sugar Producers' Association, in Maryborough (1911), stated that "these measures had in the past accomplished very great results. It was only when these measures had been neglected that the grubs had increased to a disastrous extent."

HOW TO USE ARSENIC.

At Gordonvale, during the years 1915-16, I studied the effect upon cane-grubs of several deadly poisons administered in various ways, and, after demonstrating the extreme resistance of our cane-grubs to stomach poisons, ultimately found that the only way to secure a high percentage of mortality was to induce them to devour some palatable bait liberally treated with the poison in concentrated form.

Paris green and white arsenic gave the best results, the former arsenical proving the more deadly of the two (see Bulletin No. 4). A field experiment along these lines was conducted by the writer in February, 1917, when a bait consisting of cow-pea foliage dusted with the above arsenicals at rate of 24 lb. to the acre was turned into the soil against the stools, the results being decidedly encouraging (see "Australian Sugar Journal," vol. IX., p. 230). Later, in 1919, when the cane on our Meringa experiment plots was harvested, it transpired that the highest yield (29.400 tons per acre) was obtained from Block 10, which was treated with white arsenic at rate of 10 lb. per acre, dusted on wet Mauritius beans and ploughed in; while the lowest yield (16.658 tons per acre) was derived from an application of sodium arsenate, sprayed in drills at rate of 10 lb. per acre. The above results appear to justify conclusions arrived at in 1915-16, and to indicate that arsenic, to be effective, should be administered as far as possible in a concentrated form; moreover, heavy rain tends to wash the minute particles of arsenic downwards, thereby causing additional and far greater soil adulteration. When laying out future experiment plots of this kind, it is proposed to institute a number of methods of administering arsenic that have not hitherto been tried in the field. Other forms of control will be reviewed in future monthly reports.

LOCALITIES VISITED.

On 30th May a visit was made to Hambleton Plantation, where, owing to the courtesy of Mr. F. C. P. Curlewis, I was able to have a look at some of the cane farms and note degrees of grub infestation. It was interesting to find that D.1135, which at first had appeared likely to resist attack in that locality, was finally succumbing in several places, and fast turning yellow. A block of this variety, planted June, 1920, had shown the first indication of grubs the following April, and is not expected to cut over 20 tons. A late block of the same variety, planted in September, went down in March; and 8 acres of Clark's seedling, planted at the same time, collapsed during May, and might cut 5 tons, although in January (about five months after planting) it had every appearance of being a 30-ton crop.

Mr. Curlewis directed my attention to one of those problems so full of interest to the entomologist, the solution of which might at any time throw considerable light on the question of cane-grub control. This was a 15-acre block of H.Q.426, June planting, that was stunted, and for the most part badly grub-eaten—having dropped from an anticipated yield of 30 to about 15 tons—while right alongside it, on similar soil, stood a small block of D.1135, planted the same month, but apparently free from grubs, the sticks being 7 to 9 ft. high, and promising about a 25-ton crop.

Aloomba was visited on the 3rd, and Woree on the 21st instant, when inquiries were made at both places into the reported occurrence in injurious numbers of the beetle borer of cane (*Rhabdocnemis obscurus*, Boisd). In each case, however, these alarms were proved to have been groundless.

CAIRNS SHOW EXHIBIT.

On the 8th instant we exhibited, at Woree, a small collection of insects, &c., comprising eggs, larvæ, pupæ, and adults of our various cane-beetles, together with a number of the parasitic and predaceous enemies, such as digger wasps and robber flies, that help to control the ravages of the grub pest. This display afforded opportunity for getting into touch with canegrowers, and led to much instructive discussion relative to the cane-grub problem.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JUNE, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1921.	June, 1920.		June.	No. of Years' Records.	June, 1921.	June, 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	1·53	20	2·95	0·32	Nambour	3·21	25	8·59	3·94
Cairns	2·72	39	8·12	1·75	Nanango	1·91	39	7·68	3·12
Cardwell	2·06	49	2·77	3·13	Rockhampton ...	1·92	34	7·07	0·59
Cooktown	2·00	45	4·13	1·19	Woodford	2·51	34	8·36	2·51
Herberton	0·96	34	2·68	0·94					
Ingham	2·37	29	4·94	3·94					
Innisfail	6·96	40	10·25	4·22					
Mossman	2·20	13	6·41	2·80	*Darling Downs.*				
Townsville	1·28	50	0·58	1·02					
					Dalby	1·60	51	5·57	2·12
					Emu Vale	1·31	25	4·75	1·61
Central Coast.					Jimbour	1·55	33	7·03	1·80
					Miles	1·85	36	4·28	1·93
Ayr	1·33	34	0·36	1·91	Stanthorpe ...	1·80	48	5·81	4·61
Bowen	1·62	50	0·69	1·24	Toowoomba ...	2·28	49	6·56	2·72
Charters Towers ...	1·35	39	0·33	0·75	Warwick	1·58	34	5·54	2·28
Mackay	2·70	50	2·93	3·07					
Proserpine	3·62	18	6·18	3·19					
St. Lawrence ...	2·45	50	2·90	2·88	*Maranoa.*				
South Coast.					Roma	1·64	47	3·80	2·26
Biggenden	1·76	22	3·93	2·27					
Bundaberg	2·67	38	4·48	2·67	*State Farms, &c.*				
Brisbane	2·65	70	7·98	3·24					
Childers	2·13	26	3·86	2·97	Bungeworgorai ...	1·38	7	3·76	3·19
Crohamhurst ...	4·13	25	11·05	3·83	Gatton College ...	1·55	22	6·08	2·18
Esk	1·93	34	6·29	2·35	Gindie	1·44	22	3·97	1·40
Gayndah	1·77	50	6·56	1·96	Hermitage ...	1·75	15	5·17	2·15
Gympie	2·45	51	5·57	3·12	Kairi	0·79	7	4·45	0·72
Glasshouse M'tains	3·55	13	11·15	4·73	Sugar Experiment Station, Mackay	2·34	24	3·00	3·40
Kilkivan	1·90	42	9·03	2·19	Warren	1·15	7	7·17	1·23
Maryborough ...	2·79	50	3·25	3·44					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for June this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Science.

DEHYDRATION.

On Tuesday, 5th July, Mr. T. H. Morton, A.M.I.M.E., F.R.G.S., who has had a wide experience of commercial dehydration in the United States of America, and was during the War, supervising engineer in connection with dehydrating plants operated by the Board of Agriculture in England, lectured before a large gathering of members of the Brisbane Chamber of Commerce.

The points made, *inter alia*, by the lecturer were:—

Dehydration is a comparatively modern term, adopted with the evident intention of indicating the use of ultra-modern scientific methods and machinery. The term covers, particularly, the removal of moisture content from the treated product sufficiently to ensure preservation, without damaging the vegetable cells and their moisture ducts, thus enabling their restoration, by soaking, to their original state of freshness.

The art of drying foodstuffs is very ancient, and within comparatively recent years has developed into a science.

The necessity for some suitable apparatus to bring drying more directly under the control of the operator than is possible in the open air, led to the development of various contrivances and processes.

The type of drier giving the best results and, in the lecturer's opinion, one destined to be more generally used in dehydrating fruit, vegetables, and fish, is a special form of tunnel drier.

In earlier tunnel systems a strong current of heated air was drawn or forced from end to end of a tunnel-shaped chamber, along which woven wire trays were slid from end to end on special supporting strips, attached to the sides of the tunnel or conveyed on trucks; the air currents thus flowed longitudinally between the trays in their passage from end to end. One great disadvantage of this system was that the product usually had to finish at the hottest end of the apparatus, and was thus exposed to the risk of scorching or overheating.

An improved type of tunnel system eliminated this disadvantage, by a novel arrangement for circulating the heated air of any desired humidity across the path of progress of the product in its journey through the system from end to end. From this type has been developed the powerful dehydrators constructed and operated by the British Government, and the first high-power, scientifically designed commercial fruit and vegetable dehydrator constructed in Australia.

The factory recently erected at Kendenup (W.A.) by the lecturer, for the De Garis Development Company, showed on its test that the plant exceeded the estimated output and the most sanguine expectations of those directly concerned.

The modern industrial plant erected at Kendenup was completed in fifty-four days, from the laying of the first brick to the delivery of dried fruit, and, in the lecturer's opinion, though not the largest, is the most effective dehydrator in existence.

Queensland, in the lecturer's opinion, offers one of the greatest fields in the world for successful dehydration, on account of the great variety of its fruits and vegetables.

Queensland is importing large quantities of dried fruits and vegetables, while thousands of tons of her own luscious products are being either wholly wasted or sold below cost.

Dehydration on scientific principles will go a long way to solve the recurring market glut problem.

The drying of pineapples is as practicable as drying lemons, and the product will certainly prove profitable.

Dehydrated pineapples can undoubtedly be reconditioned.

Dried fruits, according to housewives, make better jam than fresh fruit.

Large quantities of dried bananas found a ready market in England during the War, and are still in regular demand.

The lecturer was hopeful in respect to the processing of strawberries, but, so far, he had not recommended their treatment on account of their high water content.

There is no need for fear or pessimism in regard to the Australian fruit industry. In the lecturer's opinion the outlook is brighter than ever through the improvement of dehydrating processes.

Modern commercial dehydration will probably never supersede canning, but it has come to stay.

Explaining the working of a dehydrator, the lecturer said that the process includes cleaning, peeling, slicing, or cubing, and placing on conveyors for transit through the dehydrating chambers, where nothing is removed from the product but water. This is done without destroying the cellular structure or affecting the flavour or food value of the product. Currents of clean pure air, at pre-arranged temperatures, are fanned over the fruit, and the resulting product is ready for the storage room and shipment.

The chairman of the Chamber (Mr. Myers King), who presided, referred to the marketing problems that confronted the fruitgrower, and regarded dehydration as something that would immensely aid their solution. By the employment of the process, transport charges would be reduced by seven-eights. When prohibition was mooted in the United States, the grapegrowers of California collected a large sum of money to oppose the proposal, but American growers are now getting as much again for dried grapes as they were when the freshly picked product was sold for winemaking purposes.

The lecturer submitted for inspection a large number of samples of various fruits and vegetables that had been subjected to the process, the commercial possibilities of which were generally and favourably commented upon.

CONCRETE FLOORS.

Mr. Arthur Morry, surveyor, Department of Agriculture and Stock, supplies the following specification for laying a floor for cow bails with Portland cement concrete, in response to an inquirer:—

The ground to be carefully excavated to a regular surface with a fall of not more than three inches from the front of the bails to the back, any inequalities to be filled up with hard materials and well rammed with a wood or iron rammer.

Before starting to lay the concrete, fix wood screeds at top and bottom of the shed, the bottom screed to be three inches lower than the top one; these screeds to be fixed four inches above the ground line, so that when the concrete is laid, rammed, and ruled off, it will be of a regular thickness of four inches throughout. For ruling off use a long straight edge, with bottom edge shot perfectly true with the plane.

Concrete to be composed of approved Portland cement in the proportion of one cask or three bags to one cubic yard of clean river or creek gravel, with all stones more than one inch in size taken out, or, failing gravel, four parts of broken stone which will pass through one and a-half inch mesh, and two parts sand to one part of cement. This makes a concrete technically known as 4—2—1, but it must be understood that one cubic yard, or twenty-seven feet cube, of dry materials will not make one cubic yard of finished concrete, because the finer materials, such as sand and cement, go to fill up the spaces left in the larger material, such as stone. The shrinkage in finished concrete when rammed is from 23 to 27 per cent. of the dry materials, so that about thirty-one feet of gravel and cement is required for one yard cube of finished concrete.

The most convenient method of measurement is to make a box 3 ft. x 3 ft. x 1 ft. without top or bottom, fill it with gravel or stones and sand, and add one bag of cement; this will give a good mixture. Turn it over twice dry and twice when wet, then place it in position four inches in thickness between the screeds, level off with the straight edge, and well ram until the water comes to the surface. Take care that no holes are left on the surface in which the water can lodge. Do not lay on a coat of cement for finishing, as this very often comes off after a time, but endeavour to get a good face with the rammer. If this is not satisfactory, make a grout of water with equal parts of sand and cement, and stir up well until it is quite thick—too thick to flow. Pour this out on to the floor, and brush it over with a stiff broom, taking care not to leave any lumps or inequalities. This will make a good and durable floor.

The open drain should be made with the same material, with 6 in. x 2 in. curb of hardwood on each side, and it is better finished with the trowel for a smooth face.

One cubic yard of concrete or twenty-seven cubic feet will be sufficient for every eight superficial yards of floor four inches thick. This will require three bags of cement and thirty-one cube feet of dry materials for each cube yard.

What is called ash concrete is sometimes used for the above purpose. It is practically the same mix as the above, *i.e.*, six parts of ashes, with most of the dust taken out, to one part of cement, but it is necessary to make it durable to finish the surface with a ¾-inch compo. of one cement and one and a-half sand, worked up with the wood float or the steel trowel. Wood ashes are to be avoided, as they contain a percentage of potash which is injurious to the cement.

The most durable floors are made as first described.

General Notes.

SEPTEMBER SHOW DATES.

Zillmere A. H. and I. Society: 10th September.
Gympie A. M. and P. Society: 14th and 15th September.
A. and P. Society of Southern Queensland, Beenleigh: 15th and 16th September.
Sherwood Progress Association: 17th September.
Mary Valley P. A. and I. Society, Imbil: 21st and 22nd September.
Rocklea A. and I. Association: 24th September.
Southport A. H. and I. Society: 26th September.
Toombul A. H. and I. Association: 30th September.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom), June.—Professor R. C. Punnett, F.R.S. (University of Cambridge) discusses further the results of research in animal breeding. The third of a series of important articles deals entirely with poultry and rabbits, giving particulars of a most extensive series of experiments undertaken to investigate the inheritance of weight. "The Progress of Milk Recording" and the "Need for a more General Use of Improved Varieties of Seed" are discussed editorially. Other of the more important features include a paper on "The Control of Farm Management and some Fundamental Principles of Agricultural Costing," by C. S. Orwin, M.A. (Institute of Research in Agricultural Economics, Oxford); "Simple Cost Accounts for Farmers," by Sir A. Daniel Hall, K.C.B., F.R.S. (Chief Scientific Adviser); and "The Marketing of Fruit," by H. V. Taylor, A.R.C.S., B.Sc. (Deputy Controller of Horticulture).

The Tropical Agriculturist (Ceylon) for May, features a paper by Sir Arnold Theiler, K.C.M.G. (Director of Veterinary Education and Research, South Africa), reprinted from the "Journal of Agriculture, Union of South Africa," Vol II., No. 2, on "Diseases, Ticks, and Their Eradication."

The Agricultural Gazette of New South Wales for July has its customary budget of valuable information. Among its main features is the continuation of a paper on "Producing Lucerne Hay under Irrigation Conditions," and describing methods and detailing experiences at the Yanco Experimental Farm, by F. G. Chomley and F. Chaffey. Other notable features are "Reports of Farmers' Experimental Plots;" a "Description of Elephant Grass, or Napier's Fodder," by E. Breakwell, B.A., B.Sc. (Agrostologist); a continuation of a discussion on "The Feeding of Sheep in Times of Drought;" an article on "The Modern Cheesecuring Room," an interesting competitive comparison by A. T. R. Brown (Assistant Dairy Instructor); "A New Method of Determining Yields of Experiment Plots," by H. Wenholz, B.Sc. (Agr.); and a further contribution on "The Cause of Black Disease and its Methods of Transmission," by Sydney Dodd, D.V.Sc., F.R.C.V.S. (University of Sydney).

Annual Report of The Acting Administrator of The Northern Territory of Australia, 1920.—This report contains much valuable information on conditions in the Territory. On its pastoral possibilities Mr. F. A. C. Bishop, Chief Inspector of Stock, is quoted as follows: "We have approximately 335,116,800 acres of land carrying less than three-quarters of a million head of stock, when the carrying

capacity of stock in the Territory to-day, if conservation of water was on hand on all areas, should be at least four million head of cattle, and, as the country is essentially a cattle country, no time should be lost in recognising the true facts.'' The report goes on, ''Other authorities have expressed similar views. Here is a certain and safe avenue of development that no time should be lost in exploiting. The great obstacles that have confronted the pastoralists were (*a*) absence of railway communication; (*b*) absence of permanent surface water; (*c*) absence of permanently watered stock routes and camping reserves; (*d*) absence of roads for wheeled traffic; (*e*) inadquate mail services; (*f*) absence of telegraph and telephone lines; (*g*) absence of concerted effort to destroy dingoes and other pests.''

The International Review of the Science and Practice of Agriculture (Rome) for March has an original article on ''Organisation of Agricultural Bookkeeping in Denmark,'' by O. H. Larsen (Professor of Rural Economy). In Denmark, the necessity of giving close attention to farm accounts is widely recognised. Efforts are made to ascertain: (1) Amount of capital invested and manner in which it is allotted to the various agricultural enterprises; (2) comprehensive budget of gross profits, working expenses, net profits and interest on capital employed; (3) book-keeping of the various branches of the industry, showing cost of production, general and working expenses; (4) household expenses; (5) income of farmer and revenue yielded by the enterprise itself.

Among the abstracts is a mass of general agricultural intelligence from world-wide sources.

South African Gardening and Country Life, June, has among its leading features a paper on ''Roses and Rose Growing,'' by A. W. Hazell, whose magnificent rosary at Rondebosch is well known to a large number of ex-members of the A.I.F.

Journal of the Department of Agriculture, Union of South Africa (June).—J. du P. Oosthuizen, M.Sc. (Tobacco and Cotton Experiment Station, Transvaal) deals exhaustively with ''The Improvement of Cotton by Seed Selection,'' and remarks on South Africa's second effort to become a real cotton-producing country. As in Queensland, a first attempt was made as a consequence of the world shortage brought about by the American Civil War, and similar conditions afterwards operated to destroy what promised to become a staple industry.

The Twentieth Annual Report of The Bureau of Agriculture, Government of the Philippine Islands (1921), is a finely and profusely illustrated production, containing much valuable information on tropical products.

The Scientific Australian (Melbourne), 11th June, has an interesting note on ''Prickly-pear—Profitable Uses Suggested,'' in the course of which is described the result of experiments made by Lieut.-Colonel L. W. Bickle, F.R.C.S., now of Sydney, and formerly of Adelaide. ''He claimed that, by a comparatively cheap process, a new human and stock food could be made from prickly-pear.'' Other prickly-pear products include a chaff of ''higher nutritive value than wheaten hay,'' a meal capable of being made into an excellent oil cake, a fibre capable of conversion into pulp felt, or possibly a coarse paper. All these are made by a dry process. His researches also showed the possibility of medicinal uses in chest cases. ''The yield is from 12½ per cent. to 17½ per cent. of the dry products from the green slab or leaf.'' Tables of analyses are quoted to support the Colonel's claim.

VEGETATION DISEASES AND INSECT PESTS.

A chart of vegetation diseases and insect pests, illustrated in colours, is on sale at the Department of Agriculture and Stock, Brisbane, at the nominal price of 2s. 6d. The chart is suitable for framing, and should be a useful adornment for the walls of schools and meeting places of public bodies.

Answers to Correspondents.

THE FOOD AND MEDICINAL VALUE OF FRUIT.

Inquiries having been received by the Department respecting the value of various fruits as food, and also medicinally, the matter has been referred to the Director of Fruit Culture, who reports as follows:—

All fruits are of great value, not only as food, but in many cases on account of their medicinal properties.

In brief, fruit may be said to be Nature's greatest remedy. Taken as a whole, fruits tend to purify the blood, and thus keep the body in a healthy state, but individual fruits have specific medicinal qualities. For instance, grapes are valuable in the convalescent stage of many diseases, as they supply nourishment in a readily available form, and act as a cooling medium that has the effect of counteracting any slight feverish tendencies.

All fruits of the citrus family are valuable medicinally, as they act as a febrifuge in the case of mild fevers, and also as a cooling agent when used as a beverage. They have also strong anti-scorbutic properties, and are therefore very valuable in cases of scurvy, barcoo rot, and other diseases due to impure blood.

Apples are extremely valuable as a food, being easily digested, and therefore suitable for everyone. They are also valuable for their corrective properties, in that they act as an antacid, and are frequently very beneficial in cases of rheumatism and similar diseases.

Bananas are valuable as a food, both in the green and ripe stage. In the former they can be used as a vegetable, or dried and ground into flour, and in the latter they can be used either as a fresh fruit or dried and used when required. As a food, their value is high, owing to their being rich in starch and fruit sugars, both of which are valuable food products. Medicinally, bananas have no very great effect other than that possessed by all fruits—namely, that of tending to keep the body generally healthy.

The food value of pineapples consists mainly in the fruit sugar-content in the juice, but medicinally the juice is very valuable as a remedy in cases of throat affections, and it also acts as a good blood purifier.

All commercial fruits are valuable adjuncts to our daily food, and, did we depend more on their use and less on that of proprietary medicines, it would be better for the health of the community generally.

RED NATAL GRASS.

INQUIRER (Loganholm).—Your inquiry was referred to the Government Botanist, Mr. C. T. White, F.L.S., who advises as follows:—"The botanical name of Red Natal Grass is *Tricholaena rosea*. It is a native of the warmer parts of Africa, Madagascar, and Southern Arabia. It was not introduced into Queensland by this Department but by the Acclimatisation Society, who received seeds from Dr. Schomburgh, Director of the Botanic Gardens, Adelaide, South Australia, in 1876, some years before the Department of Agriculture and Stock was formed. For some years afterwards it was grown as an ornamental species, the pretty seed heads being in demand for floral work. As a fodder, reports are somewhat conflicting. However, it is quite a useful grass either for hay or grazing, an objection to it for the latter purpose being that as it has a very slender hold of the ground, stock pull it out by the roots when feeding on it. It is a pest in cultivation areas, but in small patches can be forked out. It will not stand heavy grazing, and for this reason is rarely seen to any extent in places where stock have access, it being most plentiful in cultivation paddocks, railway embankments, &c., so that turning stock on to it will generally eradicate it, not only because they tear up the old plants by the root, but also because they are very fond of the young plants, and in eating them tear them out of the ground which, of course, means their extermination."

The Markets.

PRODUCTION, PROSPECTS, AND PRICES.

The following survey is an abridgment of departmental summaries of conditions, prospects, and prices for the month ended 20th July, 1921:—

AGRICULTURE.

Early in July fairly heavy rains were reported from the whole of Southern Queensland. Freshes occurred in many rivers and creeks. In the Goondiwindi district a large area was again flooded. Heavy rains in maize-growing districts caused a suspension of harvesting operations. Considerable quantities of grain were destroyed. Heavy losses of potatoes also followed on excessive moisture. Haymaking was also retarded by the unfavourable weather. Many lucerne cuts were destroyed by untimely showers. Downs farmers were very active with planting preparations for winter cereals. Provided good growing weather continues the crop future is hopeful enough, but should a dry spring follow, ample yields may not be anticipated. The season generally continues exceptionally mild. Grass and herbage have splendidly responded to the favourable condition for good growth.

The maize market during the first week of July was not altogether favourable to the farmer and supplies were held back. As the week advanced, figures improved and competition became brisker: 4s. 0½d. was the top limit for the period. Lucerne chaff was in full supply to a dull demand with a range from 4s. 5d. to 8s. Heavy consignments of oaten chaff were received from the Border, but local lots were light. The best price was 7s. 9d. A large number of offerings were passed in. Mixed chaff was scarce and sold up to 6s. 10d. Offers from 3s. 9d. to 6s. 3d. were refused. Sweet potatoes were scarce and were quitted at from 2s. 7d. to 3s. 6d. Pumpkins, in light supply, brought 3s. Broom millet prices improved, prime hurl selling at £28 and an inferior quality at £20.

Weather Bureau advices showed the second week was dull and showery over a wide region. Farmers were anxiously awaiting a break. Field operations generally were at a standstill.

Country show reports were very favourable, a high order of excellence in respect to exhibits being attained. Sub-district displays were generally of a high standard. The number of exhibitors was not, however, nearly as large as it might be, and the interest of farmers in their local show as competitors needs, apparently, a general quickening.

Excellent reports continued to come in from the wheat areas, but it was generally recognised that seasonable temperatures are required to check tendency to rankness. Maize was marketed fairly heavily. Some lines were on the soft side. Prices remained at approximately the previous week's level. Lucerne chaff was plentiful, but the demand was listless. A large number of lines were passed in up to 7s. 9d. Sales were effected at 5s. to 9s. Weighty parcels of oaten chaff were received. Border lines sold up to 8s. and local lines to 7s. 4d. Fair samples of mixed chaff were submitted and quitted at from 4s. to 7s. 3d. Potatoes met an improved market; prices, 5s. 3d. to 8s. 7d. Sweet potatoes were still scarce and topped at 3s. 9d. Very little wheat was offered at rates from 6s. 5d. to 7s. 1d. Barley was very scarce, only one line at 4s. 10d. meeting the demand. Broom millet sold at from £21 to £27.

There was little change in the weather conditions for the week ended 20th July. The Darling Downs and other agricultural areas were looking exceptionally well for the time of the year. Early-sown wheat required frost benefit. It is expected that a fair proportion of this year's crop will be sown late, as growers have found that

dependence may be placed on quick maturing varieties. In the South Coast region arrowroot was ready for harvesting. Operations were delayed by the soddeness of the soil. Arrowroot mills were being put in order. The present price of the finished product is, however, causing disappointment to growers. The maize market improved to a slight extent. Supplies were plentiful, and 4s. 2½d. the favourable limit. Lucerne chaff was again in full supply on a lifeless market. Prime went to 8s. per cwt. The other extreme was 4s. 3d. Trans-Border oaten chaff was again in heavy supply. Local lines were scarce. The best price was 9s. per cwt. Mixed chaff was not so plentiful and sold to 7s. 1d. Sweet potatoes were not on large offer, and only a small quantity of pumpkins was received, 3s. 9d. per cwt. being the top price. Heavy supplies and improved samples of potatoes came in and quitted at from 5s. 6d. to 8s. 1d. Skinless barley found no acceptance. The price for prime broom millet was unaltered. Other qualities showed a decline.

DAIRY PRODUCTS.

Statistices for the dairy industry for four weeks ended 20th July include the following:—

PRODUCTION.—Quantity submitted for examination for cold storage:—Butter, 32,677 boxes (each, 56 lb.); cheese, 330 crates (each, 142 lb.).

This production may be viewed as surplus over and above local requirements and available for export.

SHIPMENTS INTERSTATE.—Butter, 10,718 boxes; cheese, 231 crates.

SHIPMENTS OVERSEA.—Butter, 30,103 boxes.

IN COLD STORAGE on 20th July, 1920.—Butter, 12,387 boxes (approx.); cheese, 489 crates (approx.).

FRUIT.

Excessive rainfall in the orchard areas has either retarded or caused the suspension of seasonal field operations. An exceptionally early spring seems probable as a consequence of an unusually mild and wet winter, and the possibility of late frosts to follow is not a particularly bright anticipation. Many trees and plants are still in vigourous growth; bananas and pines in particular continue to produce good fruits. Vegetables are plentiful on a fairly favourable market. Strawberries are also plentiful and a large quantity is going into preserves. In the course of the week ended 20th July shipments of canned pines were consigned to the United Kingdom. The fruit was packed in accordance with a special arrangement entered into between the Queensland Government and the Federal authorities. Recent examinations of the pack have shown it to be in excellent condition, and the consignment is in all respects equal to that put up by outside competitors. Trial consignments of canned pines, strawberry and other jams, have also been despatched to Asiatic and American markets.

SUGAR.

Harvesting is proceeding smoothly and all mills north of Townsville are now operating. At Mossman showery weather delayed the commencement of cutting, but crushing is now in full swing.

FAT STOCK.

Report for week ended 20th July:—CATTLE: 1,060 yarded, including a train load of cows from Longreach and a train load of bullocks from the same trucking centre. The market opened firm and continued so throughout for prime quality. Some cows were only in medium condition and for these the market was irregular. Prime bullock beef was worth from 28s. to 30s., with odd pens of choice quality to 32s. Prime cows quitted at from 20s. to 25s.

SHEEP.—6,600 were penned. Two train loads were trucked in from Longreach and Aramac respectively. Most of the sheep were from medium to good trade mutton. The percentage of really prime sheep was small. The market opened firm and remained so throughout. Good trade wether mutton was worth 4½d. to 5d. per lb., and prime quality to 5½d. Ewe mutton sold from 4d. to 4½d.

Farm and Garden Notes for September.

Field.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly prepared ground. Therefore, the cultivator and the horse and hand hoe must be kept vigorously at work to check the weed pests and save the growing crops as well as much future labour. Attend to earthing up any crop which may require it. There may possibly occur drying winds, dry weather, and even very late frosts, which have not been unknown in parts of this State even as late as September. Still, good showers may be looked for in October, and much useful work may be done during the present month which will go far to afford a fair prospect of a good return for labour.

The following crops may be sown:—Cotton, maize, for early crop, sweet corn, sorghums, broom millet, cowpea, red and white French millet, giant panicum (liberty millet), Sudan grass, cow cane, Rhodes grass, and paspalum, tobacco, pumpkins, and melons. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, chicory, and ginger. Plant out coffee. Sow cotton—Sea Island near the coast, and Uplands generally. Sow maize, sorghum, imphee, mazzagua, Indian cane, prairie grass, Rhodes grass and paspalum, panicum, tobacco, pumpkins, and melons, including the Cassaba melon. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, ginger, and canaigre, the latter a tuber yielding a valuable tanning substance. Plant out coffee.

Kitchen Garden.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of these, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be of great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly dug beds. What the action of salt is, is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile, and causes hardpan to form. All kinds of beans may be sown in any district. Sow French beans in drills 2 ft. apart and 9 in. between the plants, and runner beans 4 ft. between the rows and 1 ft. 6 in. between the plants. Sow cucumbers, melons, marrows, and squashes. If these are troubled with red beetle, dust the bushes with fine wood ash, or spray with Bordeaux mixture. The latter also prevents injury from fungus. Set out egg plants in rows 3 ft. each way. Tomatoes should be ready to plant out. Train to a single stem by keeping all laterals pinched off. Plant out rosellas, sow mustard, cress, lettuce, carrots, shallots, cabbage, and radishes. Good results can be expected from any of these, providing the ground is kept in good tilth and water and manure supplied.

Orchard Notes for September.

THE COAST DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the Southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as if the trees are not in this condition they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the tree; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by deep and systematic cultivation, excepting in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth, the orchard should be manured with a quick-acting, complete manure; such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods in which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Take great care in the selection of the suckers, and see that they are free from beetle borers or other diseases.

As a precaution it is advisable to cut off all old roots and to dip the corms for two hours in a solution of corrosive sublimate, made by dissolving 1 oz. of this substance in 6 gallons of water.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers.

Where necessary, manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash, 4 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft., more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bones, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable, passion vines can also be pruned now, as if cut hard back they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed from then till the time the fruit is ready to colour with bordeaux mixture, in order to prevent loss by downy mildew or anthracnose.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop. Woolly aphis should also be systematically fought wherever present, as once the trees are in leaf it is much more difficult to treat.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

Grape vines should be swabbed with the sulphuric acid solution, mentioned in the Notes for August, when the buds begin to swell and just before they burst, as a protection against black spot and downy mildew.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit-fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6 39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6 39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5 20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5 21
8	6·17	5·11	6·34	5 0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5 6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6 22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5 24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·9	6·38	5 9	6 19	5 25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6 37	5 0	6 37	5·10	6 17	5·26
18	6·23	5·5	6·37	5 0	6 37	5·11	6·16	5 27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5 0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6 36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6 13	5·28
23	6·26	5·3	6·38	5·1	6 35	5·13	6·12	5·29
24	6·26	5·2	6 38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5 1	6·34	5·14	6·10	5 29
26	6·28	5·2	6·39	5·2	6 34	5·15	6 9	5·30
27	6 28	5·1	6·39	5·2	6·33	5·15	6 8	5·30
28	6 29	5·1	6 39	5 2	6 33	5·16	6·7	5·31
29	6·29	5·1	6·39	5 2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6 39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
8 May.	●	New Moon	7	2	a.m.
15 „	☾	First Quarter	1	25	a.m.
22 „	○	Full Moon	6	15	a.m.
30 „	☽	Last Quarter	7	45	a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4	14	p.m.
13 „	☾	First Quarter	7	0	a.m.
20 „	○	Full Moon	7	41	p.m.
28 „	☽	Last Quarter	11	17	p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11	36	p.m.
12 „	☾	First Quarter	2	16	p.m.
20 „	○	Full Moon	10	8	a.m.
28 „	☽	Last Quarter	12	20	p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6	17	a.m.
11 „	☾	First Quarter	12	14	a.m.
19 „	○	Full Moon	1	28	a.m.
26 „	☽	Last Quarter	10	51	p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

DESTRUCTION OF NUT GRASS.

BY MAJOR A. J. BOYD.

How to get rid of this widely spread pest on cultivated lands has for many years past baffled practical agriculturists, whether farmers on a large scale well equipped with a variety of weed-destroying implements, or small farmers and market gardeners, who, although working small areas of land, are yet puzzled as to how to conquer the ubiquitous weed. Even scientific men who have experimented for many years in the endeavour to find a remedy have failed to do so. How to do so has been the theme of hundreds of articles in as many newspapers, but all in vain.

In May, 1903, it was brought under the notice of the Department of Agriculture of Queensland that in the Singleton district of New South Wales this noxious sedge, erroneously called grass, was dying, owing to the attacks of an insect parasite, and subsequently the same insect was referred to in the local Press, and was denominated by its entomologist as a "coccid" of the "free moving class." At the same time it was stated that nut-grass plants on which the insect occurred were being disseminated amongst cultivators of the soil in order to secure its establishment, and consequent co-operation in exterminating the weed named in localities remote from that in which the so-called "coccid" had been discovered.

Not long afterwards parcels of such plants were placed under offer, with certain conditions, in different agricultural districts of Queensland, and I believe these were despatched to those who were desirous of experimenting on the pest. The Queensland Government Entomologist, Mr. H. Tryon, with commendable foresight, had, however, anticipated the arrival of such consignments, and had taken steps, in accordance with "*The Diseases in Plants Act of* 1896," to intercept them, it being, in his opinion, essential to ascertain, before admission, not only the generic and specific identity of the insect, but also the degree of probability of its attacking other plants than the one for whose destruction it was being introduced.

On comparison with the account of a European insect—*Antonina purpurea*—he found that the new insect presented the structural features assigned to it.

Meanwhile, it was certified officially by the New South Wales Department of Agriculture that this insect, as far as was then known, had been found to be exclusively associated with nut grass.

This was a question of great importance, especially as all the known *Antonina* species were injurious to members of the grass family.

It has since been shown that the insect attacks grasses—both native and introduced (H. Tryon)—and that its check to nut grass is slight, confined to land undisturbed and chiefly exercised in dry seasons (W. W. Froggatt). At a previous Queensland Agricultural and Pastoral Conference, in 1890, the question of nut grass destruction was debated, and several well-known farmers, sugar-planters, and others suggested various modes of keeping down nut grass, some recommending its being kept down by close-feeding down with stock, or by allowing pigs to root over the infested land. Mr. W. Gibson, of Bingera (Bundaberg district), stated that he had thoroughly cleaned a patch of the weed by covering it with molasses. But he had also had excellent results by the constant use of the Planet Junior, and he considered that, with the help of this valuable implement, no harm whatever would be done by the nut grass to any crop.

An exhaustive paper on this subject will be found in a very early number of the "Queensland Agricultural Journal" (November, 1899), written by the late Mr. Philip MacMahon, Curator of the Brisbane Botanic Gardens in that year, which would be well worth reproducing.

His conclusion was that nut grass cannot be eradicated, but it can be so dealt with as to be rendered perfectly harmless. The velvet bean was tried, and it was found that the nut grass did not thrive under its dense shade. The experiment showed that a good mode of getting rid of the pest is to smother it with a dense mass of this bean, seeding down the infested land heavily. [The present condition of the Botanic Gardens lawns would appear to indicate that its eradication is practicable.—ED.]

Since those early days, many experiments have been made, but not in Queensland. The following comes from the land of agricultural experiments, the United States of America, and I have forwarded a letter I received last month from the Director of Weed Investigation, Bureau of Plant Industry, Washington, United States of America, to the Editor of this journal, suggesting at the same time that its publication will induce some of our Queensland farmers, who would like to see the last of their nut grass destroyed, to try the velvet bean. I may incidentally state this bean is a prolific leaf-producer, giving a very dense shade, and is also exceedingly hardy.

The following is the report referred to:—

"Nut grass is perhaps the most troublesome weed in the southern coastal States, from Maryland to Texas. The species is also regarded as a pest in Arkansas and California. The plant is frequently confused with chufa, from which it can be distinguished by the bitter-flavoured nuts arranged on slender underground stems like widely-separated beads on a string, as contrasted with the sweet-flavoured nuts of chufa, which occur singly. Nut grass is popularly supposed to reproduce by means of seed as well as by nuts, but extensive investigation has failed to reveal either seedlings or viable seeds.

"One of the most important phases in connection with the control of nut grass is the eradication of small patches scattered in the field. Experimental evidence has demonstrated that the most practical and economical method of eradicating small patches is the application of dry agricultural salt (the cheapest grade obtainable), at the rate of from ½ lb. to 1 lb. per square foot.

"It is practically impossible to eradicate nut grass entirely over extended areas of infestation. Nut grass land can be handled in such a manner, however, that the presence of the weed will not prove a serious detriment after the first year of effort. An excellent system of handling nut grass land follows:—

(1) Plant the infested land in corn (or cotton), preferably in check rows. Prepare the seed bed with more than ordinary care. Following each cultivation, the nut grass growing in the rows should be chopped out with a hoe in order that no green growth be allowed to persist. It is desirable to sow soy beans in the corn rows where practicable.

(2) Cultivate at least once a week, using the knife or sweep type implement. Care should be exercised not to scatter the strings of nuts to uninfested land, as is so frequently done by spiked-toothed and spring-toothed harrows, and by the shovel-type cultivator.

(3) As soon as the crop is removed, plough and harrow the land and seed with a winter cover crop, preferably oats and hairy (winter) vetch, a combination cover crop that is particularly successful in subduing nut grass.

(4) The following spring, after the oats and vetch have been harvested for hay, repeat the entire process.

"The nut grass on land handled under this system will be thinned out to such an extent that the weed will cease to be very troublesome. The few surviving nut grass plants should be cut out with a hoe. The rotation has the virtue of continuous use of the land, while the nut grass is being brought under control.

"There is no easy method of controlling nut grass, but there are many helpful points that have been developed from practical experience and experiments. The following suggestions will all be found helpful in dealing with nut grass land:—

"1. *Smother Crops.*—Nut grass will not grow in dense shade, hence any crop which will produce a thick luxuriant growth, such as velvet beans, cow peas, and soy beans sown broadcast is helpful in controlling the weed. The best results have been obtained experimentally with velvet beans. A plot of land heavily infested with nut grass was sown to velvet beans for three successive seasons, and hardly a sprig of the weed grew in the dense shade of the beans. Smother crops are useful on rich lands only, and are not successful against nut grass unless a thick, heavy stand can be grown. Other smother crops available are sweet sorghum and corn in close drills.

"2. *Grazing.*—Geese turned into cotton fields infested with nut grass will keep the tops of the grass closely clipped, and will thus hold the weed in subjection. It is advisable to give the birds other range occasionally in addition to the cotton fields. One farmer estimated that ten geese were equal to one hoe hand in his cotton. Small areas of heavily infested land may be ploughed and hogs allowed to graze the nuts, which they relish. Unless the nuts are abundant, the hogs will starve if given no other feed.

"3. *Freezing.*—The nuts are unable to withstand freezing, consequently it is good practice, particularly in the northern part of the nut grass range, to plough in the fall and leave the land rough over winter in order to expose as many of the nuts as possible to frost. A single freeze has been known totally to eradicate nut grass in ploughed land.

"The use of chemical plant poisons, applied in the form of sprays or otherwise, has been found to be impracticable in dealing with nut grass."

KAPOK.

As several inquiries have been received recently about the cultivation of Kapok, the following information has been compiled by the Government Botanist (Mr. C. T. White) for the guidance of those contemplating the cultivation of this product.

Source.—The principal tree yielding the Kapok of commerce is *Eriodendron anfractuosum* (synonyms—*Ceiba pentandra* and *Bombax pentandrum*), a tree very widely spread over the tropics of both the new and the old worlds. The principal supplies of Kapok come from Java, where the Eriodendron or Ceiba tree has for some years been under plantation cultivation. Ceylon, India, and Tropical Africa supply smaller quantities.

Other and inferior kapoks are yielded by many plants, some of which are natives of North Queensland, as for instance the Indian Simal or Silk-cotton Tree (*Bombax malabaricum*), species of *Cochlospernum*, &c. None of these, however, command prices equal to that of the true Kapok (*Eriodendron anfractuosum*).

Description.—A tall tree with a straight trunk, prickly when young, with whorls of horizontal branches. Leaves palmately divided into 7-9 leaflets. Leaflets 2½ to 6 inches long, edges entire. Flowers whitish or in some varieties rose-coloured. Seed pod oblong, about 6 inches long; seeds numerous in a pod, covered with a fine silky floss.

Cultivation.—The tree can be grown practically along the whole of the Queensland coastal belt from Brisbane northwards. It naturally does best in the tropics.

It is a high tree, attaining a height of over 100 feet and a barrel diameter of over 3 feet.

It can be propagated by cuttings or seed. Cuttings are generally preferred, as the young trees from them are usually spineless and also yield quicker returns.

A suitable distance to plant the trees would probably be about 20 to 25 feet apart. Though probably in Australia, if grown at all, the most profitable way to grow them would be as a side issue, as windbreaks or shade trees, rather than in the form of pure plantations.

From an illustration by Greshoff.]

PLATE 17.—KAPOK TREE, FLOWERING BRANCHLET, AND A RIPE SEED POD.

The following notes are taken from a translation in the Kew Bulletin of an article by Dr. E. Ulbrich in "Notizblatt des Botanischen Gartens, Berlin," 1913, pp. 1 to 34, on Kapok Cultivation in Tropical Africa:—

> Wild Kapok is of little importance for the world's supply on account of the relatively small and uncertain amount of the yield, and the soiling of the wool, which is due to the capsules having to be picked from the ground after they have ripened and fallen, on account of the great height and spiny nature of the trees.
>
> In the plantations the young Kapok trees are usually raised from cuttings. Branches as thick as a man's arm are cut off and planted 3 to 4½ feet deep in the ground, and stripped of their leaves. They grow quickly and usually give rise to spineless trees, which come into bearing rather earlier than seedlings. When the trees grow too high they are lopped in order to facilitate the collection of the fruits and to give more light to the trees planted in between.
>
> Seedlings are transplanted from the seedbeds after six to twelve months or, preferably, after eighteen to twenty-four months. The young plants grow rapidly if they are stripped of leaves and lopped at about 1½ to 2 feet above the ground. Growth is then very quick, and the trees commence to yield when they are four to six years old. Reproduction by seedlings is apt to be unsatisfactory, as the results are much less certain than by cuttings, and spiny forms are apt to occur. The best work on Kapok cultivation is G. F. J. Bley's "De Kapokcultuur op Java."

Diseases and Pests.—The trees do not seem to be bothered much by insect or fungus pests. On this subject Dr. Ulbrich goes on to say—

> The Kapok plantations do not appear to be affected to any considerable extent by parasitic fungi.
>
> They suffer, however, from the attacks of several insects, of which the most harmful are the red bugs, *Dysdercus* spp., which live in the fruits and destroy the wool. Among other insects which injure the fruits are species of *Earias* and *Helopeltis*. Quantities of the young fruits are destroyed by flying foxes. The beetle *Batocera hector* bores into the trunks and sometimes kills young trees. When a tree attacked by it is found, the holes should be filled with benzine and stopped with clay.
>
> Great damage is done to the Kapok plantations in Java by various kinds of mistletoe (*Loranthaceæ*), but nothing is yet known as to the extent to which the Kapok trees are affected by these parasites in Africa.

Uses.—Kapok is used for stuffing cushions, mattresses, &c. It is also used in the manufacture of lifebelts, for which purpose its great buoyancy renders it eminently suitable.

The seeds yield an oil and the residue can be used for manure or in the manufacture of oil cakes for stock foods.

Of other and minor uses an article in the Kew Bulletin for November, 1896, states:—

> "In India the tree yields an almost opaque gum of a dark-red colour, which is said to be astringent, and to be employed medicinally in bowel complaints. The wood is soft and used in tanning leather. An inferior reddish fibre is sometimes prepared from the bark, which is used locally for making ropes and paper. It possesses, however, no commercial value; and the barking of the tree would not compensate for the injury done to it as a source of floss. The young roots are also used medicinally in Bombay. They are dried in the shade, powdered, and mixed with the juice of the fresh bark and sugar. In Java the growing silk-cotton trees are commonly used as telegraph posts, as the branches grow so conveniently at right angles to the trunk that they do not interfere with the wires."

Preparation for Market.—The seed is cleaned by machinery and the floss pressed into bales.

The seeds freed of floss should have a similar value to those of cotton for the expression of oil and the manufacture of the residue into stock food and manurial cake.

THE NATIONAL EXHIBITION, 1921.

The Brisbane Exhibition is rightly regarded as a microcosm of the State, a representation in miniature of the rural industry of a realm, and the 1921 Show will go down in the records as one of the most successful from every point of view yet held. To those who have had an opportunity of judging, the principal show of Queensland compares rather favourably with the Royal Show, the Highland Show, and other annual stock and agricultural exhibitions in the United Kingdom. The outstanding features of this year's show were the district and one-farm exhibits, dairy and beef cattle, the forestry section, the fruit exhibits, and the display made by the Department of Agriculture and Stock. The Returned Soldiers and Sailors Producers' Association, of Woombye, were exhibitors for the first time, and their display was one of the attractions of the show. A dehydrator at work was a very popular feature, and in its neighbourhood the products of the Queensland State Cannery attracted wide attention.

DEPARTMENT OF AGRICULTURE AND STOCK.

The court of the Department of Agriculture and Stock represented an effective and practical illustration of the activities and work of its officers and staff.

The exhibit generally was indicative of the prominent part which agriculture in its true sense plays in the development of a country; and the outstanding feature in the display was the attention paid throughout every section to what may be termed its educational side.

The chief exhibits in the court were illustrative of the State's principal primary industries, and of the technical work of the officers of the Department.

Chief among the exhibits were:—

A comprehensive collection of varieties of sugar-cane from the Bureau of Sugar Experiment Stations.

A display of Merino and Corriedale wools.

An exhibit from the Stock Experiment Station, Yeerongpilly, with special reference to the tick problem, and to the work of the Institute in its relation to the stockowner and dairyman, and the part played in the preparation of vaccines and other specifics, to combat stock diseases; also of the preparation of cultures of various kinds for use in the manufacture of butter and cheese.

A collection of indigenous grasses and weeds; and of plants reputed as poisonous to stock.

A display of maize, to illustrate the improvement being effected by the seed selection work carried on by the Department.

An exhibit of wheats now in cultivation, both in the sheaf and grain form, and similarly of new varieties raised principally at the Wheat Breeding Farm at Roma; also samples of grain about to be sent to London for exhibition purposes. Milling and analytical tests of the Roma State Farm wheats were included in the exhibit, together with descriptive cards.

Samples of different varieties of barley, and oats, and a large assortment of farm and garden seeds.

An educational display of named varieties of sweet potatoes, with comparative details of data respecting the characteristics of each variety.

Two exhibits of cotton, one of which was arranged as a trophy to represent a waterfall, the second trophy being devoted to a display of representative samples from the principal cotton-growing centres in the State. Oil and cotton seed by-products were also included.

Collections of grain or dry district sorghums introduced from the Sudan (Lower Egypt), and from the Bureau of Plant Industry, U.S.A.

Special exhibits of Sudan grass plant specimens to illustrate the work of seed selection designed and being carried out by the Roma State Farm to improve the fodder and hay qualities of this valuable grass.

A collection of cowpeas in plant and seed form to show the improvement work being carried out with this plant also at the Roma State Farm.

A pure seeds display, specially arranged to educate farmers to the advantages to be gained by sowing seeds of high-producing capacity, of good germinable quality, and cleansed of all impurities.

A comprehensive display made by the Entomologist and Vegetable Pathologist, included in which was some interesting work dealing with the banana borer beetle.

An industrial exhibit from the Agricultural College, Gatton, showing the work performed by students, coupled with the display of dairy and farm products and of fodders and concentrates used in stock feeding, with special reference to the use of crushed cotton seed.

The court, as a whole, with its festoons of asparagus fern alternating with bird's nest, staghorn, and other ferns, was set off by an effective colour scheme in ivory and white, and shades of purple relieved with maroon and gold, giving to the *tout ensemble* a strikingly artistic effect.

An innovation this year in the court was an Inquiry Office. Here visitors were able to familiarise themselves with what the Department is doing, and to arrange to be kept in touch later with the work through the medium of the "Queensland Agricultural Journal."

SUGAR EXPERIMENT STATIONS' EXHIBIT.

The Bundaberg and Mackay Sugar Experiment Stations exhibited a number of new varieties, many of them being seedling canes raised in Queensland, Hawaii, Mauritius, India, and Java. There were also some canes from the adjacent island of New Guinea. Full descriptions of these appeared upon the cards attached to the canes, which also gave their commercial cane sugar content. Many of these canes are at present undergoing chemical and field tests, while others have passed the probationary period and are being distributed to canegrowers. Of these, the most successful so far have been Queensland 813, 970, 1098, Java E.K.1, E.K.28, India Shahjahanpur No. 1, Hawaii 146, and 227. These, however, only comprise a small part of the canes which have been distributed from the sugar experiment stations in the course of the past twenty years. Prior distributions included such well-known canes as Badila and the Gorus, which are very largely grown in North Queensland. One of the principal objects of the experiment station is the constant introduction of new varieties and their commercial testing. Before any cane varieties are allowed to leave the experiment stations they have to pass chemical and commercial trials through plant, first ratoon and second ratoon crops. Each variety is tested not less than four times during the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and as to whether their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials on the field, so that it may be determined whether such varieties are good croppers. They are further rigorously watched for evidence of disease, and no affected canes are allowed to go into distribution. When varieties have passed these trials they are carefully examined and packed before being sent to growers living at a distance from the stations. Farmers close at hand are permitted to visit the stations and remove the varieties selected for distribution. All canes are distributed free to canegrowers. The worthless varieties are discarded. Information of this kind could only otherwise be secured by growers and millers at the cost of much time and money, and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

In addition to the work recorded, the experiment station at Innisfail has now commenced work in the direction of raising cane from seed.

Work at the experiment stations also comprises the study of soils, cultivation, and fertilising. It is sought to introduce improved methods of cultivation, liming, fertilising, rotation of crops, conservation of moisture, and growers are taught the principles of cultivation and business methods by visits to the experiment stations, and by lectures and addresses delivered in the various sugar districts, and by the issue of bulletins. It may be claimed that this work has been highly successful, as the following figures, showing the increase in cane and sugar produced per acre and decrease in tons of cane required to make one ton of sugar, will show:—

	1899-1908.	1909-1918.
Average tons cane per acre	14.76	17.37
Average tons sugar per acre	1.60	1.99
Average tons cane to one ton of sugar ..	9.20	7.76

The sugar experiment stations analyse soils free for canegrowers, and give advice by personal interviews or by letter on the requirements of the soil in the way of

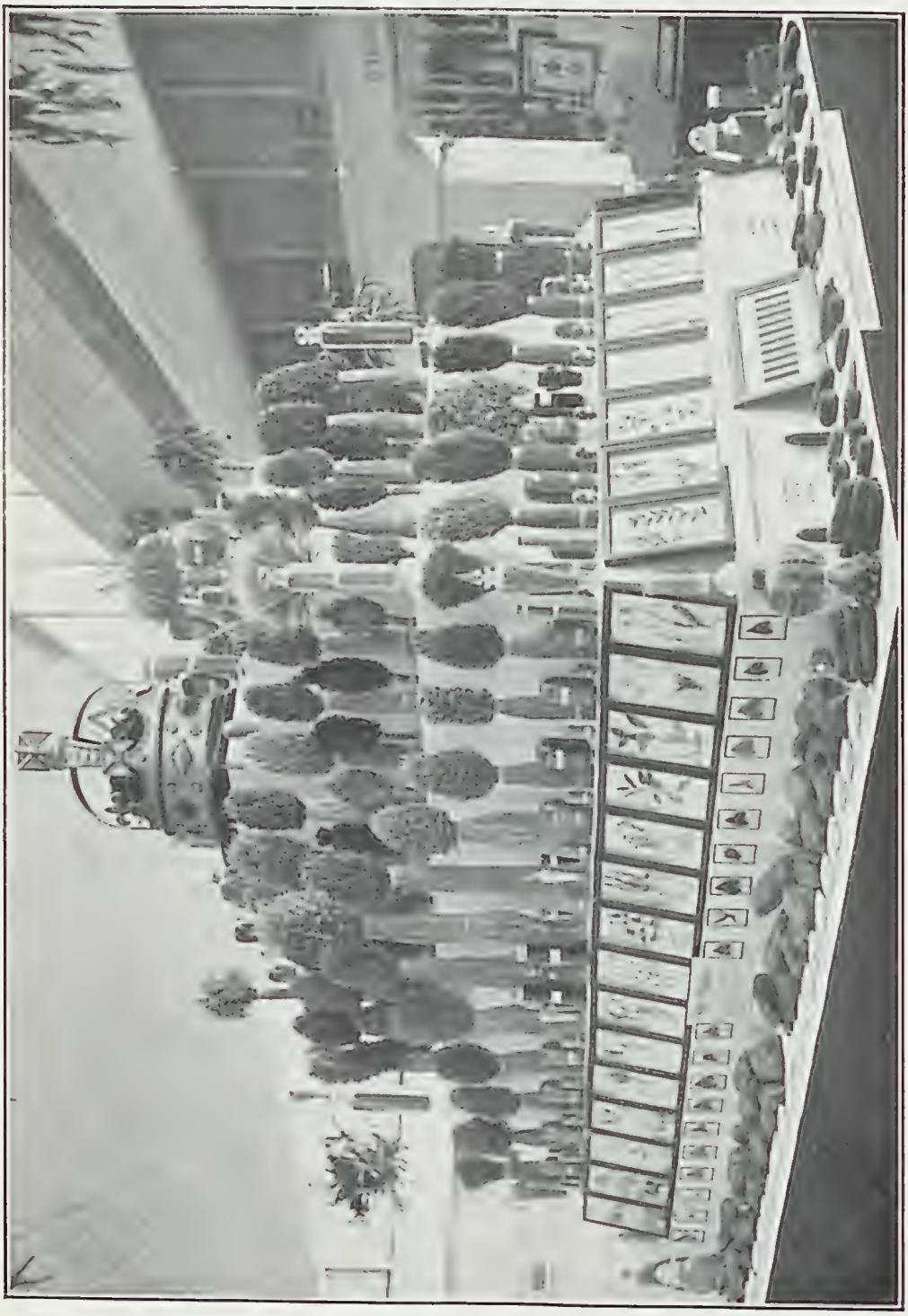


Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 18.—CENTRAL TROPHY OR GENERAL AGRICULTURE, DEPARTMENTAL COURT—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

Plate 19.—Gatton College Students' Work and Products—Departmental Display, National Association Exhibition, Brisbane, 1921.

application of lime where necessary, green manuring and fertilisers, and the treatment of the land by proper soil handling. Cane samples are also tested free of charge, so that growers may know the best time in which to cut their cane. Field officers move around amongst farmers, giving advice on cultural operations.

Investigation and research work in connection with the sugar-cane's most serious pest, viz., the grub, is now being carried out by the Bureau of Sugar Experiment Stations in a systematic manner, and numerous bulletins have been issued upon the subject. The entomological laboratories are situated at Meringa, near Cairns, which is the centre of the worst grub-infested region in North Queensland. Work being undertaken includes:—

Morphological study of reproductive organs of beetles, with relation to the period of ovipositing and the number of eggs produced.

Morphological study of the fungus parasites.

Breeding of the various local parasitic and predaceous insects in cages.

Introduction and breeding of beetle parasites from other countries.

Experimental methods for the rapid multiplication and wide distribution of our fungus parasites.

Introduction of bacterial and fungus enemies of the beetles from other countries.

A further study of various light-traps for the beetles.

A further study of repellents.

Field and laboratory experiments in the use of poisons for the grubs.

Field experiments to determine the relation of fertilisers to resistance, using green manure, stable manure, meatworks refuse, nitrate of soda, and other fertilisers.

The work of the sugar experiment stations, therefore, in relation to its promotion of the agricultural welfare of Queensland in connection with the sugar industry cannot be over-estimated. When it is considered that this industry is the greatest agricultural one in Queensland, and will produce a yield of 250,000 tons of sugar this year, estimated to be of the value of over £7,500,000, it can be seen how highly necessary it is that it should be assisted and encouraged in every possible way. Apart from its economic value, however, it has a deep national significance, and has already played a very large part in peopling the North. According to the recent census, the increase in population in the last ten years in the Herbert Electoral Division was 19.4 per cent. or 14,929 persons, a greater increase numerically than in any other part of Queensland.

THE SUGAR BELT.

Apropos of the sugar industry, it is to be noted, on reference to a map of the State, that the land in Queensland used for sugar-growing is included in a long, narrow, coastal belt. Parts of this belt are separated from each other by considerable tracts of non-sugar country. The latter, owing to a deficient rainfall or poorness of soil, are not utilised for cane. This belt is included between latitudes 16 deg. and 28 deg. south, and the bulk of the staple is grown within the tropics. Cane soils vary considerably in character and composition.

District.	Soils.
Cairns.. ..	Partly shaly sterile soils, but in the main, deep alluvial sandy loams, also rich red volcanic soils.
Mackay ..	Shaly in parts, with better alluvial over the lower levels. Mixed volcanic and rich siliceous alluvia.
Bundaberg ..	Rich alluvial delta soils, interspersed with sterile soils and deep rich red volcanic soils.

The bulk of the sugar soils can be stated to be from good to rich alluvial, such as river flats, with deep red volcanic soils of considerable depth. The nature of the country is generally designated "scrub" and "forest." The North Queensland scrubs are really jungles, carrying a thick growth of what is known as scrub timber, such as silky oak, bean, pender, kauri, silkwood, Johnstone River hardwood, interlaced with lawyer vine and other creeping plants, while the stinging tree is also conspicuous. Forest country usually consists of ironbark, bloodwood, Moreton Bay ash, blue gum, poplar gum, and acacia.

The following are average analyses of a number of soils from each of the three sugar districts mentioned:—

District.	Lime.	Potash.	Phosphoric Acid.	Nitrogen.
Cairns	·292	·310	·141	·122
Mackay	·829	·223	·165	·122
Bundaberg	·636	·144	·404	·120

Rainfall.—The Queensland rainfall, fortunately, is highest during the summer period, at which time the cane plant makes its maximum of growth. The following are average rainfalls in the principal sugar-growing districts:—

Cairns	92.65
Johnstone River	160.88
Herbert River	84.91
Mackay	66.67
Bundaberg	44.40

Cane grows best when the relative humidity of the atmosphere is high, and this is the case during the wet season in Northern Queensland.

Queensland's sugar production in 1867 was 338 tons, and in 1917, 307,000 tons.

Australia is the only place in the world where cane sugar is produced by white labour. We are in competition with countries which produce sugar by black labour and under black-labour conditions. In Java, wages are only about one shilling a day, the worker keeping himself. Without protection through the tariff, or regulation of the price by the Government, it would be quite impossible for the Australian industry to survive.

There is stated to be about £15,000,000 invested in the Queensland industry. It is the greatest industry in the State.

No other agricultural industry in Australia employs so much manual labour.

THE STOCK DISEASES EXPERIMENT STATION, YEERONGPILLY.

At the Exhibition the range of exhibits from this station comprised:—

Economic bacteriology and laboratory products, including vaccines for blackleg, contagious mammitis in cows, strangles in horses, and autogenous vaccines for sepsis.

Natural pleuro-pneumonia virus specially prepared, and blood taken with antiseptic precautions for inoculation for tick fever. Tuberculin for diagnosing tuberculosis. Pure cultures of lactic acid bacteria for the ripening of milk and cream in the manufacture of cheese and butter.

Pure cultivation of disease-producing organisms growing in tubes of artificial nutrient media. Tubercle bacilli (human and bovine), malignant œdema bacilli, blackleg bacilli, anthrax bacilli, typhoid bacilli, coli communis, chicken cholera, fowl enteritis, and pus-producing organisms.

Diagrams drawn from the microscope and illustrating the following:—

The life history of the anthrax bacillus to the spore and back to the bacillus.

The various forms of tick fever germs within the red blood corpuscles of infected animals.

Charts and diagrams illustrating the results of tick eradication work in the United States of America.

Diagrams and charts illustrating how milk becomes contaminated on the farm, and the necessity for pasteurising all milk and dairy products before being fed to calves and pigs.

Museum specimens illustrating manifestations of various animal diseases, including tuberculosis, actinomycosis, pleuro-pneumonia, tick fever, blackleg, swine fever, and other disorders.

WOOL SECTION.

The versatility of Queensland as a woolgrowing State was evidenced by the different types and characteristics of the wools on exhibition. These were specially selected to illustrate the differences exercised by "environment," and were also indicative of the fact that wools of the highest standard of quality are produced here. A special exhibit was made of samples of wool from stud flocks, and of

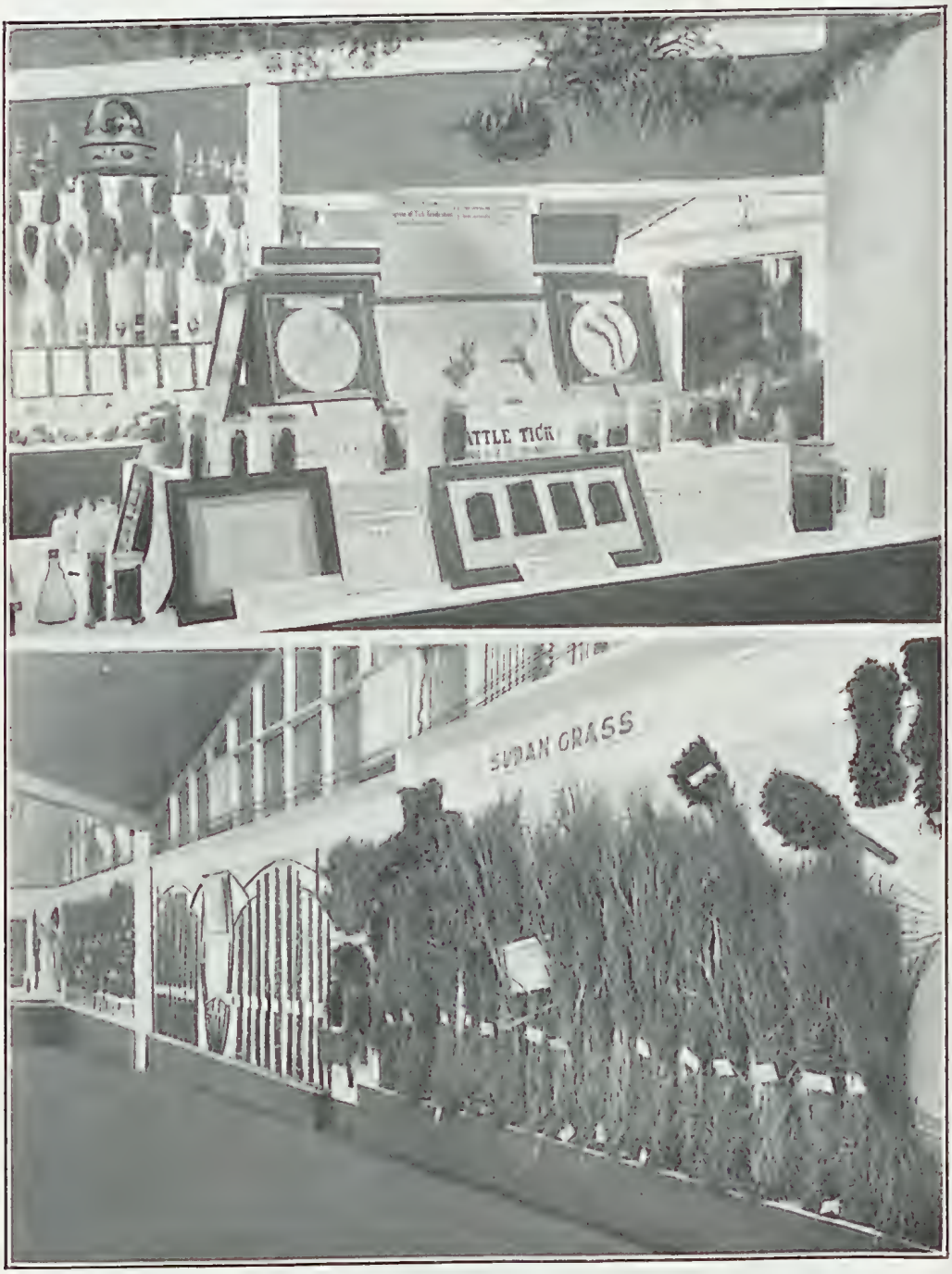


PLATE 20.—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

1. Stock Institute.
2. Corridor, showing Grasses and Sugar-cane.

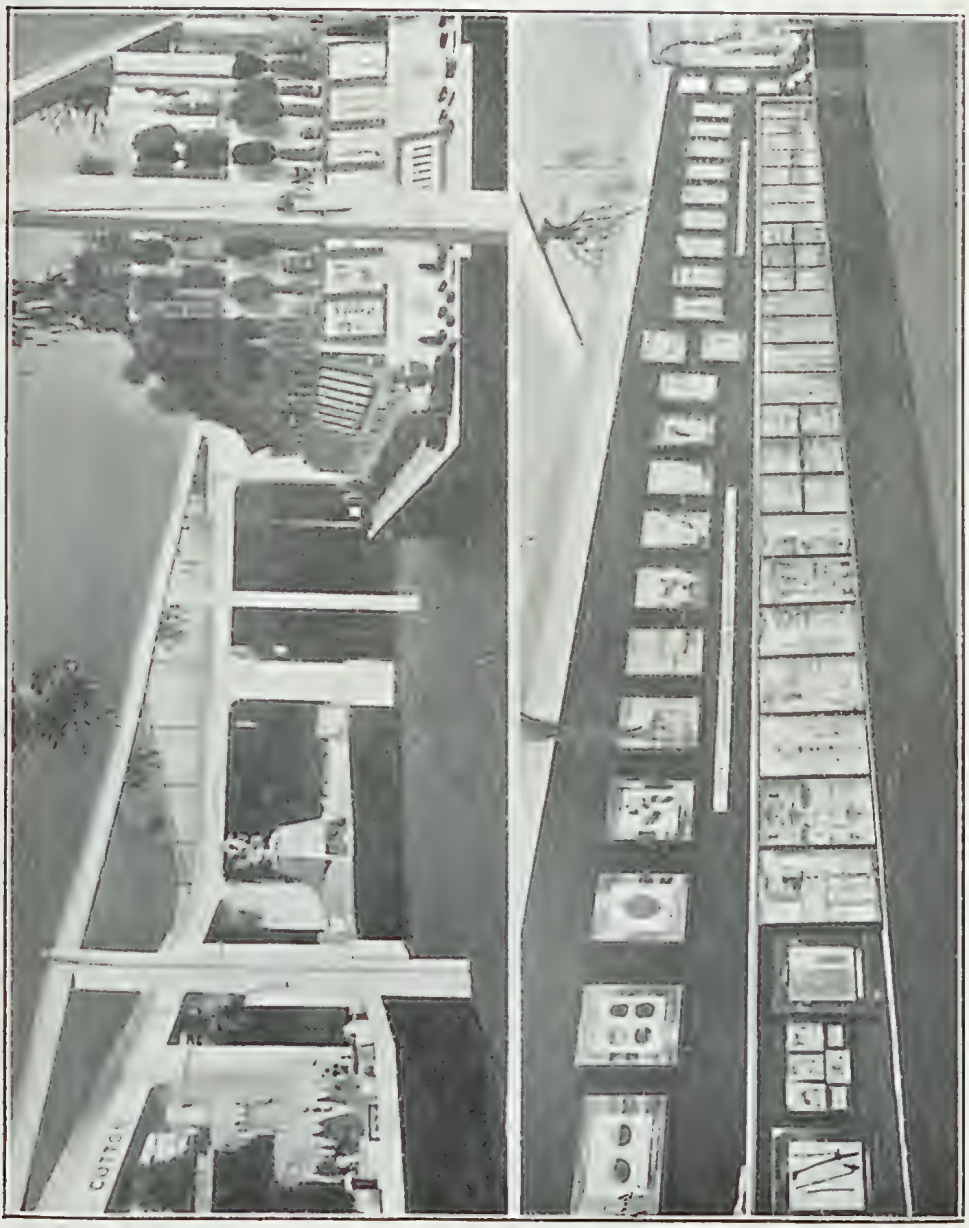


Plate 21.—Departmental Display, National Association Exhibition, Brisbane, 1921.

1. Interior of Court, showing Cotton and General Agriculture.
2. Bureau of Entomology.

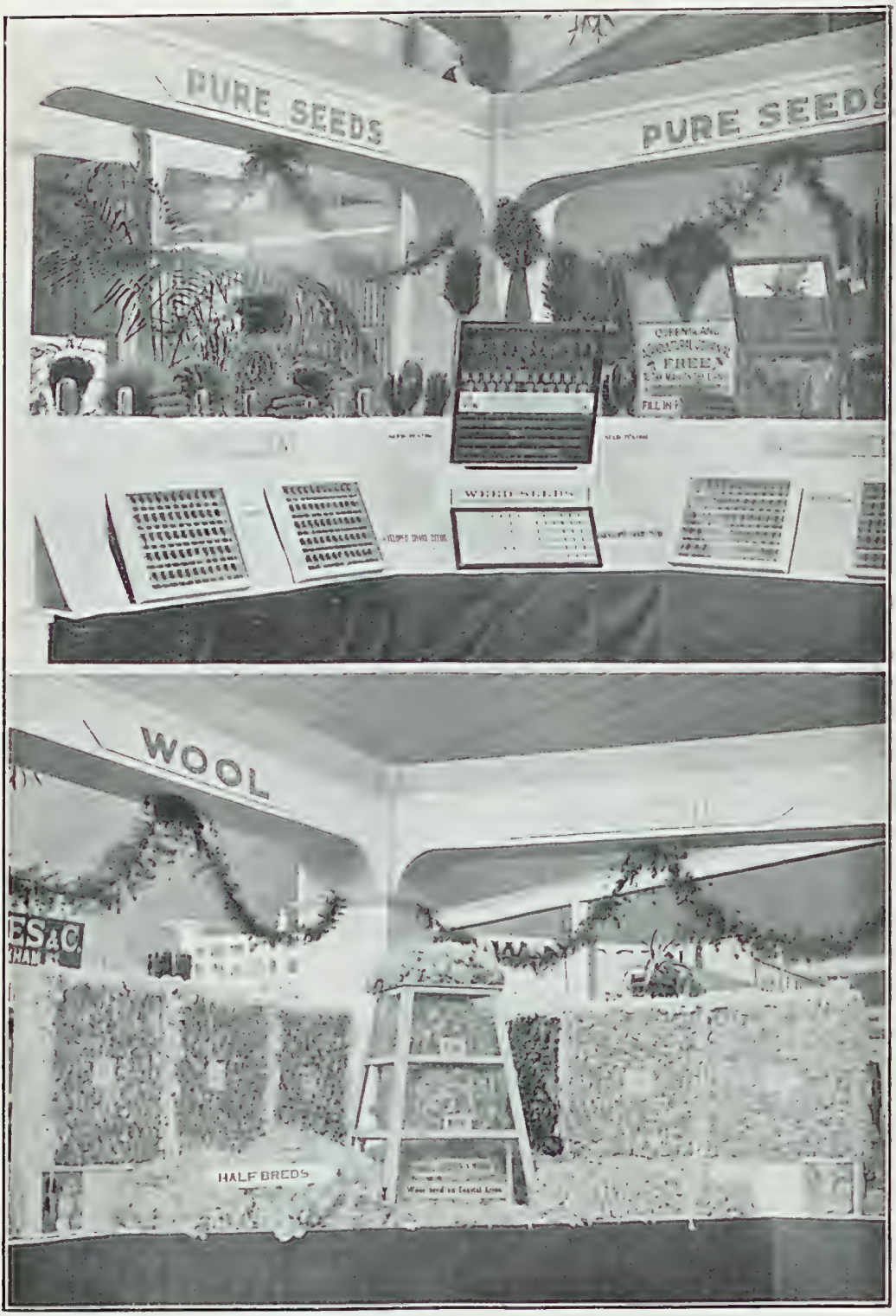


PLATE 22.—DEPARTMENTAL DISPLAY, NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

1. Pure Seeds Bureau.
2. Sheep and Wool Bureau.

Photo. Dept. of Agriculture and Stock.]

Plate 23.—Exhibit of Cotton and By-products—National Association Exhibition, Brisbane, 1921.

Corriedale wool from sheep in Western Queensland, which proves that this and other British breeds will even thrive side by side with the Merino; and the quality of the wool does not suffer by comparison with that raised even in Victoria and New Zealand. Educational interest was added to the exhibit by the display on cards of practical information and advice on the treatment of sheep fly, the preparation of drenches for stomach worms, and other parasites.

BOTANICAL DIVISION.

The work of the botanical section was represented by collections of grasses, forage plants, and weeds and plants poisonous to stock. In all cases attention was drawn to the fact that this division is always willing to name and report on any specimens of weeds, grasses, trees, and other growths forwarded by farmers or others for identification.

Grasses.—Queensland has always had a reputation for the richness of its pastures, and the comprehensive collection of indigenous grasses and forage plants staged by the Department bore testimony that such has been well earned.

Among the andropogons are the far-famed blue grasses; these are of particular value on account of their palatability and nutritious qualities, some of the larger sorts such as *Andropogon annulatus* and the tassel blue grass being especially noteworthy; as a whole, however, they are not particularly drought-resistant. The genus Astrebla comprises the highly esteemed Mitchell grasses, of which at least four very distinct kinds occur in Queensland. The chief characteristic of these and some other inland species of grasses and herbage are not only their very great nutritive value but the tenacity of life they possess, their drought-resistant qualities, and the rapid way in which they recover and respond to falls of rain, even after long periods of drought, their value in this respect being nothing short of marvellous. It is doubtful if these qualities are to be found to the same extent in the plants of any other country. Among the star grasses are several species esteemed for their fodder value. These belong to the same genus (Chloris) as the imported Rhodes grass. The genus Anthistiria contains several sorts of the kangaroo grasses, and a near ally of them is the Flinders grass, one of the most nutritious of the Western grasses—palatable both green and dry. Quite an array of panic grasses was on exhibit, and grasses of this genus are generally highly esteemed. Beautiful grasses of various species of Eragrostis, or love grasses, though perhaps containing none of great outstanding value, are useful in mixed pastures, like many others of secondary importance. The button grasses and the crowfoot are of cosmopolitan distribution; of the former the annual sort is very highly valued as a sheep fodder. Several native species of paspalum were shown, and among them were some of considerable importance, particularly as fodders in the more tropical parts. The native sorghums are large-growing, rather coarse grasses, but both horses and cattle do well on them and relish the fodder yielded, especially when cut and fed as a forage crop. Coastal grasses were represented by the coast couch, couch spinifex, and others useful as sand-binders on the sand dunes, and as mud-binders on salt flats and estuarine areas, as well as for fodder in such places. Of grasses especially adapted for wet or swampy situations, especial attention was drawn to the water couch, rice grass, *Panicum proliferum*, *Panicum obseptum* (an especially good water grass), and two sorts of Chamæraphic swamp couches.

In addition to fodders, several of the larger grasses yield material suitable for paper pulp, and in this connection the blady grass or lalang, and the common reed (Phragmites) have received some attention, and may yet have a considerable value in this respect in the near future.

Edible Trees and Shrubs.—Among the more remarkable and valuable economic features of the Australian vegetation is the number of shrubs and trees of dried inland "scrubs" and open country that are edible for stock. The collection shown proved interesting to stockowners, pastoralists, and agriculturists generally. Among the many sorts that may be especially noted are the mulga, kurrajong, apple-tree, wild orange, native pomegranate or bumble tree, emu bush, whitewood, weeping myall, cattle bush, cotton bush, and various species of saltbushes. All these and others have helped to keep stock not only alive but in good condition during long spells of dry weather. The conservation, propagation, and further utilisation of these valuable plants is a matter of national importance. They are particularly valuable in prickly-pear areas, and the fine condition of cattle that sometimes come off pear country in drought periods is due almost entirely to them, these edible trees and shrubs yielding nutritive elements not found in the pear.

Weeds.—On the central trophy was displayed a collection of weeds, special attention being directed to those harmful to stock in any way, such as the thorn apples (*Datura* spp.), pimpernel, heart-leaf poison bush, and peach-leaf poison bush.

MAIZE.

The section devoted to this cereal called attention to what may rightfully be termed "The King of Grains." The average aggregate yield of maize in the State, taken over a period of years, exceeds 3,000,000 bushels annually, the produce of approximately 149,000 acres, and at times upwards of 4,000,000 bushels are harvested. The average yield per acre still leaves much to be desired and there is room for improvement both in quantity and quality of grain, and effort is being directed by the Department to the standardising of types and to the improvement of individual crop yields. Consequently the selection of seed maize of this character, calculated to suit Queensland conditions, ranks among the foremost of the Agricultural Department's activities.

For several years past the Department, by adopting a policy of seed propagation plots, has been able to offer to growers at reasonable rates graded seed of improved varieties and types of maize. That this action is appreciated is shown by the increased demand for such seed, with a consequent improvement in yields and quality of grain throughout many of the maizegrowing portions of the State and instances are on record where yields have exceeded 100 bushels per acre under field conditions. Standard varieties of maize were exhibited in this section, and proved their high educational value.

Specimen ears showing good, bad, and indifferent types were prominently displayed, and were explained by means of clearly printed labels in large type, drawing attention to the qualities to be valued, or avoided, in each individual ear, so that this section of the Departmental exhibit might be of the highest educational interest and value to growers.

SORGHUMS.

No more popular crop is grown for stock-feeding purposes than sorghum, of which many varieties exist. The most wonderful drought-resisting qualities of this class of fodder, together with its nutritive value, commends it to the dairy farmer, particularly in dry districts, as a standby in preference to maize, when pastures are failing. For the purpose of ensilage-making and providing a bulk ration for dairy stock, it has few equals. Certain varieties have strong frost-resistant qualities, and may be sown in late summer to provide a standover crop of bulky succulent fodder in the early winter months, especially in those districts where only light frosts are experienced.

Grain Sorghums.—Whilst not so universally grown, these are fast coming into more general use for purposes of food for horses, cattle, pigs, and poultry. Their ability to produce grain under conditions which would be fatal to maize justifies their cultivation by all owners of stock.

Instances have been reported from the Darling Downs where the cultivation of feterita has supplanted that of maize for purposes of horse feed, with results entirely in favour of this variety of grain sorghum.

Poultry-farmers invariably report favourably on this class of grain, and in one instance, on a large poultry farm, unqualified success was attained by feeding the birds entirely with this grain.

Millions of bushels of grain sorghums are raised annually in the United States of America by farmers who recognise the economic value of this crop.

With a view to improvement in the varieties of grain sorghums already introduced into Queensland, several varieties have been imported from the Sudan and United States of America. These sorghums have already been tried in various districts, and although the recently introduced varieties are not yet acclimatised, many have given satisfactory results. Specimen bottles of seeds, showing a range in size and colouring, were on exhibition; also numerous samples of seedheads to illustrate the prolific nature of the crop.

Analytical charts indicating the food values of the several varieties occupied a prominent position, and go to prove that the analytical chemist plays an important part in determining the relative value of these grains for stock-feeding purposes.

WHEATS.

This section was of unusual interest to the wheatgrowers of the State, as the 1920 crop marked a most important period in the history of the production of this cereal in Queensland, as it proved to be the largest ever harvested—something over 4,000,000 bushels. This was the first occasion also on which it was found necessary to formulate a wheat pool for the purposes of handling and marketing the crop on co-operative lines.

The display of new crossbred wheats, in conjunction with the results of milling and analytical trials, was representative of the work of breeding and selecting types of wheat suitable for this State. This work is now being carried out at the Roma State Farm, where, for the season 1920, some record yields of wheat were obtained with many of the varieties now under observation. In order that none but suitable wheats (both from the growers' and millers' standpoint) may be introduced into

PLATE 24.—THE "QUEENSLAND AGRICULTURAL JOURNAL" CORNER.

Photo. Dept. of Agriculture and Stock.]

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 25. A DISPLAY OF QUEENSLAND FRUITS BY THE QUEENSLAND FRUITGROWERS' ASSOCIATION—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

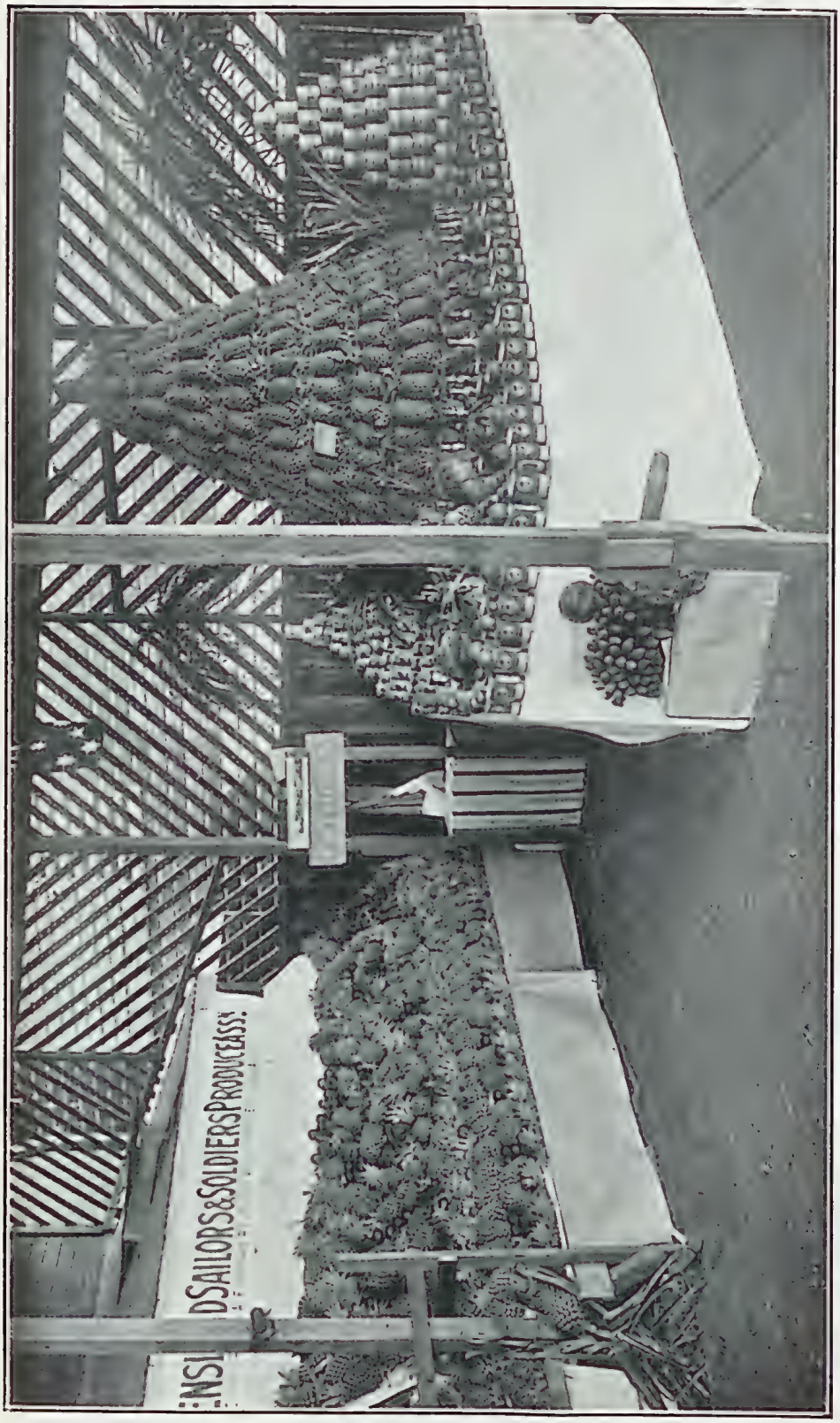


Photo. by Department of Agriculture and Stock, Brisbane.

PLATE 26.—DISPLAY OF FRUIT PRODUCTS BY THE SAILORS AND SOLDIERS PRODUCE ASSOCIATION, WOOMBYE—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

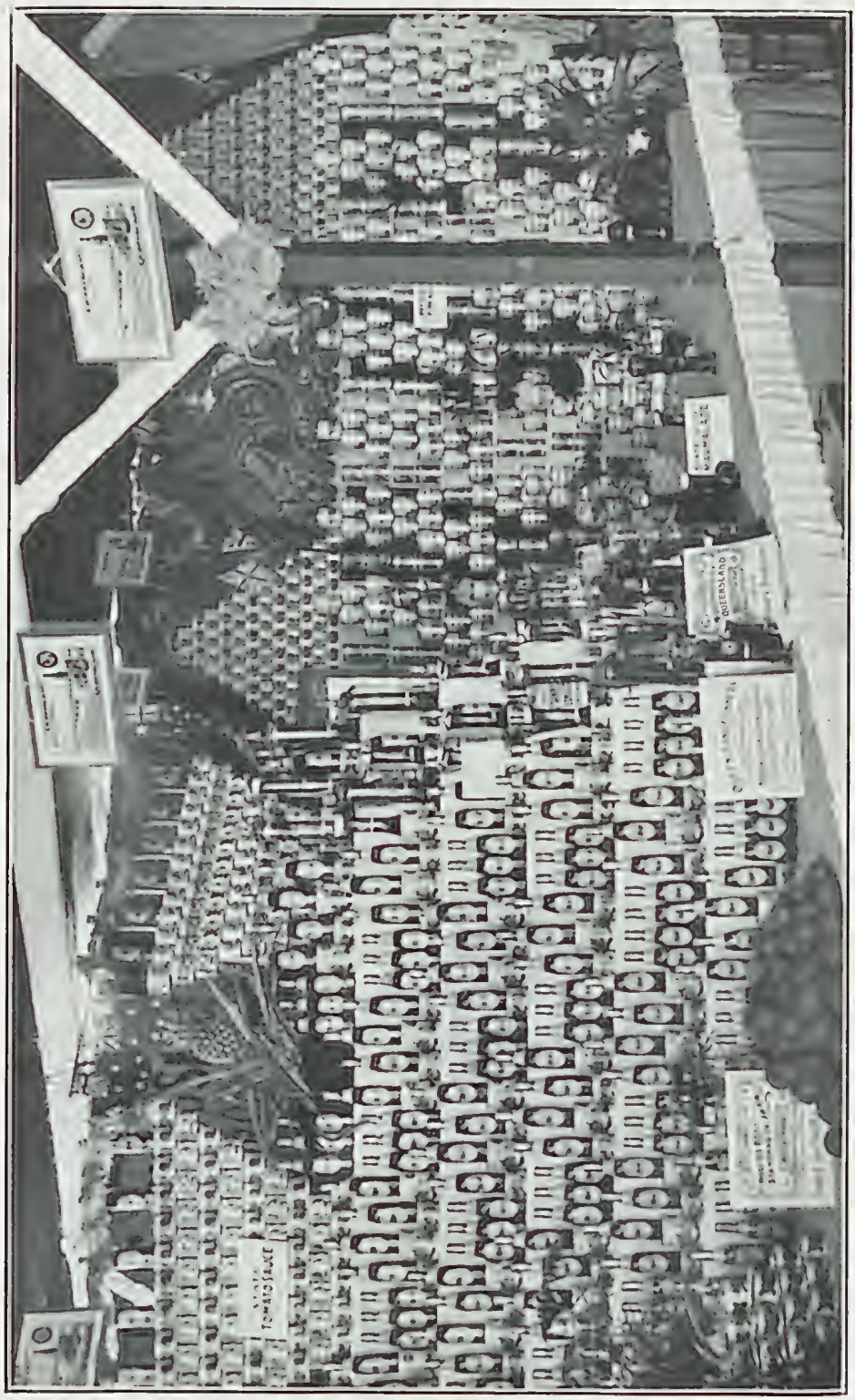


Photo: Department of Agriculture and Stock, Brisbane.

PLATE 27.—EXHIBIT OF PRODUCTS BY THE STATE CANNERY—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

general cultivation by the Department of Agriculture, careful analytical and milling tests are conducted in the laboratory for the purpose of ascertaining the nutritive food values of individual wheats. Comparative field tests are also being carried out to ascertain their suitability under normal and adverse conditions of growth. Thus it is possible to ascertain to the fullest extent the general characteristics and value of a variety before its liberation for general use.

Few growers of this necessary cereal probably recognise the care and patience demanded of the wheatbreeder in his endeavour to introduce an improved variety of wheat. The delicate operation and necessary skill which attend cross-fertilisation, the successful raising of the plant from seed obtained by the crossing of two varieties, the selection of a type from the resulting plants and its ultimate observation and fixation, culminate in subsequent trials over larger plots under varying field conditions, until by repeated tests certain new and improved types are produced, which in turn are submitted to the chemist for the final determination of their milling and nutritive qualities. Having passed this routine satisfactorily, the new variety is tested in different districts and under varying soil conditions before it is considered worthy or otherwise to be brought into general cultivation. Of the many hundreds of varieties produced, few reach the stage of being classed amongst the useful wheats of the world. In wheatbreeding, it is decidedly the "survival of the fittest."

MISCELLANEOUS FARM AND GARDEN SEEDS.

Due prominence cannot always be given in a combined display, such as that staged, to individual exhibits that in many instances represent important industries, such as the growing of malting and Californian brewing types of barley, which is carried on in a fairly large way on the Darling Downs, and the growing of canary seed, a crop which of late years has come into much favour with farmers, also on the same tract of country.

Another bird seed crop of recent introduction, as far as the commercial utilisation of the seed is concerned, is French millet, a summer-growing variety, all the more valuable on this account in case of a failure of or of the necessity for supplementing the canary seed crop. One feature which claims attention on the part of these two crops and of others of kindred character—like liberty, Japanese, and Manchurian millets—is their excellence as green crops and for making into hay.

The value of different forms of artificial fodder, and the wisdom of cultivating a variety of crops which may be used for this purpose, is freely acknowledged by the dairyman and pigbreeder who has the prosperity of his business at heart.

Numerous specimen sheaves of plants and of seeds which have proved valuable, either alone or in combination with other crops, for stock purposes were displayed. Nature in Queensland is at times "wondrous kind" in the matter of providing its abundance of natural pastures and herbage; but the stockowner as a class is rather prone to disregard the lessons of the drought, and of the fact that a multiplicity of crops can be readily grown in normal seasons. Perhaps no better inspiration can be found as an incentive to progress and to a safer competence than the word "provide," which should be indelibly stamped on every barn door and silo throughout the State.

Some well-grown samples of flax (linseed) were exhibited as an illustration of the fact that the crop can be produced in moist seasons. Although Victoria is the only State possessing a flax mill, there is a movement on foot here to test the growth of linseed as a commercial proposition, notably near Toowoomba, so that, should results warrant the establishment of such a mill, there will be a means at hand to effectively cope with the crop on a co-operative treatment basis.

Cotton.—Public attention has lately been focussed on this crop, as being peculiarly suited to conditions in Queensland, and from the specimens, both of seed cotton and lint, exhibited, it was seen that this State is fully capable of producing cotton of the best quality. With a view of extending its cultivation, the Government is advancing 5½d. per lb. to all growers of seed cotton, for a further period of two years, actually up to 30th June, 1923. Last season's crop was the heaviest recorded in Queensland for a considerable period, and to the present date the Department of Agriculture and Stock has received on behalf of the growers, for ginning purposes, approximately 710,000 lb. of seed cotton. Late last month 664 bales of cotton, weighing approximately 50 tons, were shipped to Liverpool by the s.s. "Westmoreland," and additional shipments are expected to be made in the near future.

In the course of the past season the Department initiated a scheme of seed selection with a view to the propagation of improved strains, and in connection with this work plots have been established in several districts.

Sweet Potatoes.—Special mention is demanded by this section, dealing as it does with a crop largely grown throughout Queensland, and which plays a useful part on the farm for stock-feeding purposes.

The sweet potato ranks high as a starch producer, and as a source of supply of power alcohol.

For some time the Department of Agriculture has been engaged in placing the classification and testing of sweet potatoes on a more satisfactory basis, and, with this in view, propagation plots were established for raising the several varieties under observation. Considerable progress has been made in this direction and in the compilation of data, and recently analytical tests were conducted to ascertain their respective nutritive qualities, and it has been shown in the comparative trials that some of the larger varieties are capable of affording heavy yields—upwards of 30 tons to the acre.

The exhibit comprised nearly fifty varieties of potatoes, and the characteristics and respective starch production of each was clearly set out in tabulated form on cards in close proximity to the tubers. Specimen leaves also of each kind, specially mounted for the purpose, were also shown.

Sudan Grass.—This popular variety of the sorghum family, of comparatively recent introduction into Queensland from the Bureau of Plant Industry in U.S.A., is commencing to show reversions in type and characteristics amounting to a pronounced loss of productivity of individual plants.

With a view of carrying out certain seed improvement work with special strains of this plant, selections have been made at Roma State Farm, where this fodder has been under close observation since its introduction.

The specimens on exhibition proved the value of careful and systematic seed selection for hay and fodder purposes, and served as an object lesson to growers.

Individual plants were also shown, to illustrate the varieties and reversions to be met with in commercial crops of this "grass."

Cowpeas.—An interesting and educational exhibit was staged in that section devoted to cowpeas, showing the results obtained by cross-breeding experiments at Roma State Farm.

As a summer crop (in localities and on soils unsuited to the growth of lucerne), and one which plays an important part in the restoration of humus to the soil, cowpeas have few, if any, equals. Apart from that, it forms a valuable food, in a "cured" condition, for milch cows and working horses, being extremely rich in protein.

The benefits accruing from the ploughing-in of a crop of cowpeas on heavy soils are fully recognised, particularly on sugar lands, where the crop is highly valued as a soil renovator and for supplying nitrogen and vegetable matter.

Cowpeas are aso particularly valuable in connection with pig-raising, being prized for fattening off animals under the paddock system.

PURE SEEDS SECTION.

The exhibit of 240 varieties of agricultural and vegetable seeds, and a named collection of the 90 weed seeds most frequently found in impure samples, directed attention to the work of the Pure Seeds and Stock Foods Branch of the Department.

The importance of having seeds tested, before sowing, will be realised when it is stated that during the year ended 30th June, 1921, out of every hundred samples of Rhodes grass seed examined, thirty-five had a germination of less than 20 per cent. In every hundred samples of lucerne seed, nine samples contained more than the prescribed amount of weed seeds or inert matter. An idea as to what 1 per cent. by weight of a weed seed means will be more clearly understood when it is realised that 1 per cent. of darnel in 1 lb. of oats means the buyer would sow 390 seeds of this weed. One per cent. of oriental rocket equals no less than 17,900 seeds in 1 lb.

Queensland produces a larger quantity of millets, lucerne, Sudan grass, and other seeds than is usually supposed, and there is much to be said in favour of seed grown within the State. This, however, requires to be cleaned with as much care as that produced elsewhere, and farmers would do well to ascertain the percentage of purity and germination of their own seed, as well as that purchased from a neighbour. Particular attention is directed to the using of ungraded seeds, some of which may contain seeds of a poisonous nature, such as *Datura stramonium*. These find their way into chaff and other stock foods, and may lead to serious loss of stock.

Buyers of both stock foods and seeds should let quality, rather than price, be their guide, and in the case of any doubt as to the goods purchased, write to the Department without delay, so that the matter may be investigated whilst the goods are intact and the facts fresh in the memory of both buyer and seller.

It cannot be too widely known that buyers whose main source of income is derived from agricultural pursuits may send samples of seeds for analysis, no charge being made provided the seeds were purchased as seeds for sowing, and the following particulars given:—

(1) Vendor's name and address;
(2) Name of seed;
(3) Quantity purchased;
(4) Locality where the seed is to be sown; and
(5) Name and address of purchaser.

The weight of samples sent should not be less than 8 oz. of oats, cowpeas, maize, &c., 4 oz. of sorghum, Sudan grass, panicum, millet, lucerne, &c., and 2 oz. of Rhodes and paspalum grasses. If the result of the examination is required for purposes of sale a fee of 2s. 6d. is charged.

ECONOMIC ENTOMOLOGY AND PLANT PATHOLOGY.

The Division of Entomology and Vegetable Pathology, under Mr. Henry Tryon, exhibited objects of unique interest, as illustrative of its educational activities, all of which have been prepared by his assistants, Messrs. Edmund and Hubert Jarvis, and are alike expositions of scientific work and artistic skill.

The display embraced three different groups—

(1) Economic insects, life histories;
(2) Plant diseases, colour portrayals; and
(3) Insectivorous birds—stomach contents;

in each of which, samples from the Departmental collections were on view.

The insectivorous bird section, four large cases, relating to some fifty birds and about thirty different kinds, illustrated the procedure followed and results secured in examining the contents of the birds' stomachs, and indicated the actual food partaken of shortly prior to death, and the extent to which insects enter into its dietary. On any question then that arises as to a bird being actually insectivorous, and as to the insects it consumes, it yields evidence that cannot be gainsaid.

The group illustrating disease occurrence comprised a selection of coloured nature prints based on photographs (taken by the photographic artist—Mr. Mobsby—and his assistant), and aimed at the portrayal of plant-maladies as the growers see them. The twenty-four pictures on view illustrated maladies of citrus (orange and lemon), coffee, banana, apple, grape, potato, cabbage, lucerne, and maize. Another method used in making manifest the appearance, action, and effect of plant-disease was shown in a special case devoted to the Irish blight of the potato.

The economic entomology (life histories) group, was of striking interest, and was quite unique in its way. It comprised thirty cases, illustrating the life-phases of upwards of seventy different insects, the injuries that the several plants they attack evince, and in many cases their parasites and other natural enemies. These illustrations comprised actual specimens of the insects themselves, coloured drawings of them, both natural size and enlarged, and specimens illustrating their depredations; and in the case of fruits, models of wax. This series also comprised some stock pests, including beautifully depicted figures of the nine sheep-blowflies, and the so-called poisonous caterpillar of cattle (*Pterygophorus uniformis*). Among plant-destroyers may be mentioned Tryon's fruit fly, with twelve of the cultivated fruits it is wont to destroy; the yellow maize moth and the eleven plants and fruits it injures; thirty-nine insects attacking the orange, including twelve of the scale-insects associated in this work; the ladybird, the flea beetle, the tuber moth, the green caterpillar injuriously related to the potato, the cutworm, the diamond moth, the stem worm (*Hellula undalis*) and the pyralid (*Godaracomalis*) of the cabbage, the blue weevil, and the web-worm of the sweet potato, the bean fly, weevils of pea and bean species, the pumpkin beetle, the army worm (*Leucania unipunta*) of cereals, the grain weevil, the grain moth (*Sitrodrepa cereallela*), and the flour moth (*Ephestia kuehniella*).

Whilst the cotton insects were represented by an illustrative exhibit of the four Queensland sap-sucking species, there was also a case showing species of those remarkable leaf-eating insects, the phasmidæ or spectre insects.

Not the least important feature in the display of the Entomological Branch related to a single injurious insect. This exhibit was by J. L. Froggatt, B.Sc., entomologist in charge of banana beetle borer investigations. It comprised numerous examples of the two sexes of *Cosmopolites sordidus* (the insect in question) and its eggs—both free and *in situ*—a case especially devoted to the weevil's life history; and again, portions of banana corm and stem that served to manifest the extent as well as the nature of this pest's depredations.

QUEENSLAND AGRICULTURAL COLLEGE.

This section was of educational interest, and illustrated certain phases of the instructional work imparted to students. Prominence was given to exhibits of cheese, butter, and dairy produce generally; to examples of carpentry, and of blacksmithing and saddlery, representing industrial sections, a knowledge of which is of much importance to the man who has to wrest a living from the land.

A variety of farm produce, and of wool raised and classed at the College, was also displayed.

A special section of the trophy was devoted to fodder conservation and the uses of different classes of farm-grown fodder in conjunction with concentrates, more particularly with crushed cotton seed, as quantities of cotton seed are now available in Queensland and offers a cheap and nutritive adjunct for stock-feeding purposes.

Photo. by Dept. of Agriculture and Stock.]

PLATE 28.—COMPLETE WORKING SECTION OF A MODERN DEHYDRATOR—NATIONAL ASSOCIATION EXHIBITION, BRISBANE, 1921.

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 29.—QUEENSLAND AGRICULTURAL COLLEGE CHAMPION GUERNSEY BULL "SURPRISE OF GRON."

Photo. Department of Agriculture and Stock, Brisbane.]

PLATE 30.—QUEENSLAND AGRICULTURAL COLLEGE FORMER CHAMPION FRIESIAN COW "PRIM."

DISTRICT EXHIBITS.

"A" GRADE

The district exhibits were well worthy of the regions represented. The West Moreton display was a most comprehensive one, and covered the whole field of activity in local primary and secondary production—Ipswich, Esk, Toogoolawah, Lowood, Marburg, Boonah, and Rosewood being the chief contributing centres. The Wide Bay and Burnett had a very fine court in which products from every sub-district were well to the fore—Maryborough, Bundaberg, Gayndah, South Burnett, Gympie, Mary Valley, Kin Kin, and Cooran all sending comprehensive exhibits. The Darling Downs entered the lists for the first time since 1918, and made an excellent show of products from every centre from Toowoomba to Texas.

Following are the details of the competition:—

	Possible Points.	Wide Bay and Burnett.	Darling Downs.	West Moreton.
(1) DAIRY PRODUCE (210)—				
Butter, 1 box	90	84	78	83
Milk, condensed, concentrated, or dried	40	..	28	36
Cheese, 1 cwt.	60	45	45	48
Eggs	20	5	18	15
	210	134	169	182
(2) FOODS (185)—				
Hams and bacon	50	44	45	46
Rolled and smoked beef and mutton	20	5	12	17
Smallgoods and sausages, if smoked or preserved	10	4	8	9
Fish—Smoked, preserved, and canned	10	3	7	2
Canned meats	25	..	10	20
Lard, tallow, and animal oils	20	5	15	17
All butchers' by-products, not included in any other part of scale of points	10	..	8	8
Honey, and its by-products	20	14	18	15
Confectionery	10	6	8	5
Bread, biscuits, scones, and cakes	10	..	7	2
	185	81	138	141
(3) FRUITS, VEGETABLES, AND ROOTS (Fresh and preserved) (195)—				
Fresh fruits—all kinds	60	54	39	50
Preserved fruit, jams, &c.	30	18	27	20
Dried fruits	10	5½	9	4
Fresh Vegetables—all kinds, except potatoes	25	9	22	19
Prepared and dried vegetables, pickles, sauces, &c.	10	5	7	6
Potatoes	40	25	25	30
Roots—all kinds—and their products, arrowroot, cassava meals, &c.	14	10	10	8
Cocoanuts, peanuts, and other nuts	6	4	3	2
	195	130½	142	139
(4) GRAIN, &C. (150)—				
Wheat, meals prepared therefrom	50	33	43	23
Maize	50	30	40	44
Flour, &c.	10	6	8	..
Oats, rye, rice, and their meals	30	21	25	15
Maizena, &c.	10	4	7	..
	150	94	123	82
(5) MANUFACTURES AND TRADES (155)—				
All woodwork	30	20	23	28
All metal and ironwork	30	26	23	24
Leather and all leather work and tanning	20	11	17	15
Manufactured woollen and cotton fibre	30	..	10	30
All tinwork	10	8	6	7
Artificial manures	10	9	3	6
Brooms and brushes	10	2	8	2
Manufactures not otherwise enumerated	15	7	12½	14
	155	83	102½	126

DISTRICT EXHIBITS—*continued.*

—	Possible Points.	Wide Bay and Burnett.	Darling Downs.	West Moreton.
(6) MINERALS AND BUILDING MATERIALS (100)—				
Gold, silver, and precious stones	25	13	13	8
Coal, iron, other minerals, and salt	30	13	15	19
Stone, bricks, cement, marble, terracotta	20	12	14	18
Woods—dressed and undressed	25	22	20	25
	100	60	62	70
(7) TROPICAL PRODUCTS (150)—				
Sugar-cane	60	52	2	25
Sugar (raw and refined)	20	18	..	4
Rum, spirits, and by-products	10	3	6	10
Coffee (raw and manufactured), tea, and spices	10	4	3	5
Cotton (raw) and by-products	30	20	10	15
Rubber	10	..	..	..
Oils (vegetable)	10	5	..	5
	150	102	21	64
(8) WINES, &C. (25)—				
Wines	15	3	10	7
Aerated and mineral spa water	10	6	10	7
	25	9	20	14
(9) TOBACCO (20)—				
Tobacco (cigar and pipe) in leaf	20	2	15	6
(10) HAY, CHAFF, &C. (170)—				
Oaten, wheaten, lucerne, and other hay	30	15	20	25
Grasses and their seeds	7	3	6	4½
Oaten, wheaten, lucerne, and other chaffs	50	25	40	38
Ensilage and other prepared cattle fodder	20	10	10	15
Sorghum and millets	10	4	6	6
Commercial fibres (raw and manufactured)	10	7	8	6
Pumpkins and other green fodder	10	6	8	8
Hemp and flax	10	5	8	2
Broom millet	10	5	5	7
Farm seed	13	6	11	7
	170	86½	122	118½
(11) WOOL, &C. (110)—				
Scoured wool	40	35	25	30
Greasy wool	60	50	48	49
Mohair	10	10	7	9
	110	95	80	88
(12) ENLARGED PHOTOGRAPHS	5	1	5	5
(13) EFFECTIVE ARRANGEMENT (80)—				
Comprehensiveness of view	30	10	30	20
Arrangement of sectional stands	15	8	15	12
Effective ticketing	20	2	20	15
General finish	15	8	15	12
	80	28	80	59
Totals	1,555	906	1,079½	1,094½

SUMMARY.

—	Wide Bay and Burnett.	Darling Downs.	West Moreton.
No. 1, Dairy produce (210)	134	169	182
No. 2, Foods (185)	81	138	141
No. 3, Fruits, vegetables, and roots (195)	130½	142	139
No. 4, Grain, &c. (150)	94	123	82
No. 5, Manufactures and trades (155)	83	102½	126
No. 6, Minerals and building materials (100)	60	62	70
No. 7, Tropical products (150)	102	21	64
No. 8, Wines, &c. (25)	9	20	14
No. 9, Tobacco (20)	2	15	6
No. 10, Hay, chaff, &c. (170)	86½	122	118½
No. 11, Wool, &c. (110)	95	80	88
No. 12, Enlarged photographs (5)	1	5	5
No. 13, Effective arrangement (80)	28	80	59
Total (1,555)	906	1,079½	1,094½

"B" GRADE.

The Northern Darling Downs won the "B" Grade competition in the district exhibit with a total of 794 points. Maranoa was second with 774 points, and Kingaroy third with 765 points. This was the first time the winners had competed. The district comprises Dalby, Chinchilla, Bakingboard, and adjacent localities.

The following are the awards:—

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(1) DAIRY PRODUCE (170)—					
Butter	90	83	83	80	79
Cheese	60	51	..	50	46
Eggs	20	15	16	15	10
	170	149	99	145	135
(2) FOODS (120)—					
Hams, bacon, rolled and smoked beef and mutton	50	36	25	30	32
Fish—smoked	10	..	6	1	4
Lard, tallow, and animal oils	15	12	7	10	10
Honey, and its by-products	25	14	15	12	11
Confectionery (home-made)	10	6	4	8	6
Biscuits, bread, cakes, and scones (home-made)	10	9	6	6	6
	120	77	63	67	69
(3) FRUITS, VEGETABLES, AND ROOTS— Fresh and preserved (190)—					
Fresh fruits—all kinds	60	35	50	40	36
Preserved fruits and jams, &c., prepared by farmer	20	14	18	10	13
Dried fruit, prepared by farmer	5	3½	3½	4	4½
Fresh vegetables—All kinds except potatoes	25	17	14	20	18
Preserved and dried vegetables, pickles, sauces, &c.	10	7½	8½	7	7
Potatoes	40	30	27	22	27
Roots—all kinds—and their products, arrowroot, cassava meal, &c.	10	6	3	3	5
Cocoanuts, peanuts, and other nuts	10	6	2	3	3
Vegetable seeds	10	8	7	4	6
	190	127	138	118	119½

"B" GRADE—*continued.*

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(4) GRAIN, &c. (150)—					
Wheat	50	15	15	30	43
Flour	10	5	3	8½	7½
Maize	50	42	35	36	38
Maizena, meals, starch, glucose, &c.	10	4	2	4	..
Oats, barley, malt, and pearl barley, and their meals	30	18	9	18	14
	150	84	64	96½	102½
(5) WOODS (40)—					
Dressed and undressed	25	18	20	23	18
Wattle bark	15	14	13	14	10
	40	32	33	37	28
(6) HIDES (10)—					
Free from offensive smell	10	6	6	7½	6½
(7) TROPICAL PRODUCTS (100)—					
Sugar-cane	60	10	45	..	..
Coffee, tea, and spices	10	1	1	..	..
Cotton (raw) and by-products	30	8	10	8	15
	100	19	56	8	15
(8) MINERALS (55)—					
Gold, silver, and precious stones	25	7	13	..	7
Coal, iron, and other minerals, and salt	30	5	9	11	18
	55	12	22	11	25
(9) TOBACCO (20)—					
Tobacco (cigar and pipe), in leaf	20	5	6	8	10
(10) HAY, CHAFF, &c. (170)—					
Lucerne, oaten, wheaten, and other hay	30	18	13	19	21
Grasses and their seeds	7	6	5	7	3½
Oaten, wheaten, lucerne, and other chaffs	50	25	25	28	23
Ensilage and other prepared cattle fodder	20	15	12	9	6
Sorghum and millets	10	8	5	5	6
Commercial fibres	10	7	6	..	8
Pumpkins and other green fodder	10	7	6	8	7
Hemp and flax	10	7	5	4	8
Farm seeds	13	10	6	6	4
Broom millet	10	5	7	8	8
	170	108	90	94	94½
(11) WOOL, &c. (110)—					
Scoured wool	40	35	30	40	35
Greasy wool	60	45	48	55	60
Mohair	10	7	8	9	10
	110	87	86	104	105
(12) ENLARGED PHOTOGRAPHS	5	2	1	5	3

"B" GRADE—*continued.*

—	Possible Points.	Kingaroy.	Gympie.	Northern Darling Downs.	Maranoa.
(13) LADIES' WORK (30)—					
Needlework, knitting, fine art ..	15	10	11	10	14
School work, maps, writing, &c., for pupils of schools in the district	15	11	8	13	10
	30	21	19	23	24
(14) EFFECTIVE ARRANGEMENT (80)—					
Comprehensiveness of view ..	30	15	30	26	8
Arrangement of sectional stands	15	8	15	12	4
Effective ticketing	20	5	15	20	20
General finish	15	8	15	12	5
	80	36	75	70	37
Grand totals	1,250	765	758	794	774
SUMMARY.					
1. Dairy produce	170	149	99	146	135
2. Foods	120	77	63	67	69
3. Fruits and vegetables	190	127	138	118	119½
4. Grain	150	84	64	96½	102½
5. Woods	40	32	33	37	28
6. Hides	10	6	6	7½	6½
7. Tropical products	100	19	56	8	15
8. Minerals	55	12	22	11	25
9. Tobacco	20	5	6	8	10
10. Hay and chaff	170	108	90	94	94½
11. Wool	110	87	86	104	105
12. Enlarged photographs	5	2	1	5	3
13. Ladies' work	30	21	19	23	24
14. Effective arrangement	80	36	75	70	37
Totals	1,250	765	758	794	774

ONE-FARM EXHIBITS.

There were four competitors in the one-farm section, three of whom made their first entry as exhibitors. The result was a win for Mr. K. Haag, of Teviotville, Fassifern.

Following are the details:—

—	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(1) DAIRY PRODUCE (50)—					
Butter, 6 lb.	25	19	17	22	17
Cheese, 1 large and 2 small ..	20	9	13	..	10
Eggs, 1 dozen	5	3	3	4½	2
	50	31	33	26½	29
(2) FOODS (65)—					
Hams, 15 lb.; bacon, 15 lb. ..	20	17	9	15	12
Corned, smoked, and spiced beef and mutton, 10 lb.	10	8	5	7	6
Honey, 12 lb.	10	4	7	..	6
Beeswax, 6 lb.	5	5	5	4	5
Bread, 2 loaves; scones, 1 dozen	5	2	3	5	4
Confectionery and sweets, 3 lb. ..	5	1	5	3	4
Cakes, &c.	5	1	4	3	3
Lard, tallow, oils	5	3	3	3	3
	65	41	41	40	43

ONE-FARM EXHIBITS—*continued.*

	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(3) FRUITS, VEGETABLES, AND ROOTS—fresh and preserved (143)—					
Fresh fruits, all kinds	25	10	14	11	12
Dried fruits	10	4	5	4	8
Preserved fruits and jams	15	5	14	12	12
Fresh vegetables	15	10	12	9	6
Pickles, sauces, &c.	15	4	14	11	11
Potatoes, 56 lb. (or collection and roots)	25	16	23	18	17
Table pumpkins, squashes, and marrows, 56 lb.	10	6	10	9	8
Cocoanuts and nuts	3	1	2	2	3
Vegetable and garden seeds, 5 lb.	5	..	5	4	5
Arrowroot, 10 lb.	5	..	5	5	4
Cassava, 3 lb.	5	..	..	3	..
Ginger, 3 lb.	5	..	..	..	..
Sugar beet, 3 lb.	5	3	..	..	3
	143	59	104	88	89
(4) GRAIN, &c. (65)—					
Wheat	25	12	8	4	20
Maize	20	7	16	10	18
Barley	20	16	14	7	14
	65	35	38	21	52
(5) TROPICAL PRODUCTS (45)—					
Sugar-cane, 24 stalks or 1 stool	30	5	12	20	..
Cotton, in seed, 10 lb., long staple	10	5	5	9	4
Coffee, 10 lb.	5	..	..	3	..
	45	10	17	32	4
(6) TOBACCO leaf, dried, 5 lb.	10	..	..	8	3
(7) HAY, CHAFF, &c. (117)—					
Hay, oaten, wheaten, lucerne, and other varieties	20	6	14	14	18
Grasses and their seeds, including canary	10	4	10	8	9
Chaff, oaten, wheaten, lucerne, and other varieties	20	11	19	12	13
Ensilage, any form	15	..	14	..	12
Cattle fodder, pumpkins, and green fodder	15	12	15	14	14
Sorghum and millet	10	5	3	10	10
Hemp, 5 lb.	5	..	4	4	..
Flax, 5 lb.	5	..	4	4	4
Cowpea seed, 7 lb.	7	6	6	5	6
Broom millet	10	..	9	9	8
	117	44	103	80	94
(8) WOOL (25)—					
Greasy, 5 fleeces	20	17	17	16	17
Mohair	5	..	..	4	..
	25	17	17	20	17
(9) DRINKS, &c. (10)—					
Temperance drinks, 6 bottles	10	5	7	6	4

ONE-FARM EXHIBITS—*continued.*

——	Possible Points.	G. E. Pullen.	K. Haag.	W. Allen.	J. Donges.
(10) WOMEN'S AND CHILDREN'S WORK (30)—					
Needlework, knitting	7	3	7	7	4
Fine arts	3	..	3	2	1
School work, maps, writing, &c.	10	7	..	6	..
Fancy work	10	6	9	8	3
	30	16	19	23	8
(11) Miscellaneous articles of commercial value	5	3	4	4	5
(12) Plants and flowers, in pots ..	5	2	5	3	3
(13) Time and labour saving useful articles, made on the farm ..	10	10	6	8	6
(14) Effective arrangement of exhibits	10	7	9	8	10
(15) Arrangement of stand ..	5	3	5	4	5
(16) Effective ticketing	5	4	5	4	5
(17) General finish	10	5	8	8	10
	50	34	42	39	44
Grand totals	610	292	421	383½	387

MILKING TESTS.

Subjoined are the details of the milking tests conducted in connection with the Exhibition. Judges: Messrs. R. W. Winks and L. F. Anderson, Brisbane.

COW, 4 YEARS OLD AND OVER, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk. Lb.	Commercial Butter.	Pts. Butter Fat, 24 Hours.	Lact. Points.	Total Points.
Lawrence's Charmer 2nd of City View	M.	22·3	1·180	..	..	..
	E.	19·5	1·451	..	..	..
	M.	16·5	·978	..	..	..
	E.	17·11	1·307	..	..	..
		75·8	4·916	39·32	10	49·32
A. Pickel's Royal 4th of Blacklands	M.	20·14	1·640	..	..	..
	E.	18·7	1·545	..	..	..
	M.	18·12	1·361	..	..	..
	E.	18·4	1·437	..	..	..
		76·5	5·983	47·86	..	47·86
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie 3rd of Nestles	M.	29·0	·876	..	..	..
	E.	32·12	1·380	..	..	..
	M.	29·14	1·036	..	..	..
	E.	27·14	1·265	..	..	..
		119·8	4·557	36·4	..	36·4
M. Lawrence's Princess of City View	M.	22·10	·975	..	..	..
	E.	19·11	·967	..	..	..
	M.	22·0	·920	..	..	..
	E.	18·0	1·040	..	..	..
		82·5	3·902	31·21	3·4	34·61
B. O'Connor's Tulip IV. of Hill View	M.	25·8	·945	..	..	..
	E.	24·6	1·162	..	..	..
	M.	25·5	1·092	..	..	..
	E.	23·12	1,100	..	..	..
		98·15	4·299	34·38	..	34·38
B. O'Connor's Wakeful of Oakvale	M.	25·12	·803	..	..	..
	E.	26·0	1·280	..	..	..
	M.	24·14	1·105	..	..	..
	E.	24·4	1·080	..	..	..
		100·14	4·268	34·14	..	34·14
P. Moore's Lovely of Sunnyside ..	M.	23 9	·757	..	..	..
	E.	16·15	1·010	..	..	..
	M.	21·7	1·201	..	..	..
	E.	21·0	1·010	..	..	..
		82·13	3·978	31·82	1·9	33·72

MILKING TESTS—*continued*

—	—	Milk. Lb.	Commercial Butter.	Pts. Butter Fat, 24 Hours.	Lact. Points.	Total Points.
S. H. Hosking's Margaret Anglin 2nd of Berry	M.	21·3	·616	..	..	..
	E.	21·8	·870	..	..	..
	M.	22·10	·684	..	..	..
	E.	22·4	·930	..	..	..
		87·9	3·100	24·8	8·9	33·7
B. O'Connor's Dahlia 2nd of Hillview	M.	28·15	1·028	..	..	..
	E.	26·4	·977	..	..	..
	M.	29·10	1·029	..	..	..
	E.	27·7	1·013	..	..	..
		112·4	4·047	32·36	..	32·36
Livingston Bros.' Young Duchess 4th	M.	24·6	·841	..	..	..
	E.	20·1	·932	..	..	..
	M.	26·6	1·135	..	..	..
	E.	21·8	·980	..	..	..
		92·5	3·888	31·1	1·2	32·3
A. Pickel's Jean V. of Blacklands	M.	22·11	·861	..	..	..
	E.	19·13	·634	..	..	..
	M.	22·1	·741	..	..	..
	E.	18·9	·637	..	..	..
		83·2	2·873	22·98	8·9	31·87
S. H. Hosking's Duchess of Hanover of Berry	M.	28·4	·755	..	..	..
	E.	28·4	·947	..	..	..
	M.	30·0	·940	..	..	..
	E.	28·15	1·138	..	..	..
		115·7	3·780	30·24	..	30·24
Jackson and Schofield's Butter Maid 2nd	M.	16·10	·695	..	..	..
	E.	16·3	·859	..	..	..
	M.	17·4	·677	..	..	..
	E.	16·1	·792	..	..	..
		66·2	3·023	24·19	1·3	25·5

COW, 4 YEARS AND OVER, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk. Lb.	Test.	Commercial Butter. Lb.
A. Pickel's Royal 4th of Blacklands	M.	20·14	6·7	1·640
	E.	18·7	7·1	1·545
	M.	18·12	6·2	1·361
	E.	18·4	6·7	1·437
		76·5	..	5·983
M. Lawrence's Charmer II. of City View	M.	22·3	4·5	1·180
	E.	19·5	6·4	1·451
	M.	16·5	5·1	·978
	E.	17·11	6·3	1·307
		75·8	..	4·916

MILKING TESTS—*continued.*

—	—	Milk. Lb.	Test.	Commercial Butter. Lb.
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie III. of Nestles	M.	29·0	2·6	·876
	E.	32·12	3·6	1·380
	M.	29·14	3·0	1·036
	E.	27·14	3·9	1·265
		119·8	..	4·557
B. O'Connor's Tulip IV. of Hillview	M.	25·8	3·2	·945
	E.	24·6	4·1	1·162
	M.	25·5	3·7	1·092
	E.	23·12	4·0	1·100
		98·15	..	4·299
B. O'Connor's Wakeful of Oakvale	M.	25·12	2·7	·803
	E.	26·0	4·2	1·280
	M.	24·14	3·8	1·105
	E.	24·4	3·8	1·080
		100·14	..	4·268
B. O'Connor's Dahlia II. of Hillview	M.	28·15	3·1	1·028
	E.	26·4	3·2	·977
	M.	29·10	3·0	1·029
	E.	27·7	3·2	1·013
		112·4	..	4·047
P. Moore's Lovely of Sunnyside	M.	23·9	2·8	·757
	E.	16·13	5·1	1·610
	M.	21·7	4·8	1·201
	E.	21·0	4·1	1·010
		82·13	..	3·978
Livingstone Bros.' Young Duchess IV.	M.	24·6	3·0	·841
	E.	20·1	4·0	·932
	M.	26·6	3·7	1·135
	E.	21·8	3·9	·980
		92·5	..	3·888
S. H. Hosking's Duchess of Hanover of Berry ..	M.	28·4	2·3	·755
	E.	28·4	2·9	·947
	M.	30·0	2·7	·940
	E.	28·15	3·4	1·138
		115·7	..	3·780
(UNDER STANDARD.)				
Jackson and Schofield's Butter Maid II.	M.	16·10	3·6	·695
	E.	16·3	4·5	·859
	M.	17·4	3·4	·677
	E.	16·1	4·2	·792
		66·2	..	3·023

MILKING TESTS—*continued.*

COW OR HEIFER, UNDER 4 YEARS, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk.	Test.	Commercial Butter.
		Lb.		Lb.
E. Burton's Oxford Golden Buttercup.	M.	20·9	4·2	1·002
	E.	19·13	5·0	1·160
	M.	19·10	3·9	·895
	E.	14·13	7·0	1·225
		74·13	..	4·282
M. Lawrence's Present of City View	M.	19·4	4·0	·890
	E.	18·0	5·4	1·150
	M.	17·14	3·5	·725
	E.	19·1	4·9	1·093
		74·3	..	3·858
E. Burton's Oxford Noble Dot II.	M.	15·12	3·7	·680
	E.	17·4	6·4	1·297
	M.	15·9	5·2	·953
	E.	14·0	5·2	·860
		62·9	...	3·790
M. Lawrence's Red Duchess III. of City View ..	M.	18·14	2·6	·570
	E.	17·6	3·2	·641
	M.	20·7	3·4	·803
	E.	19·0	3·8	·850
		75·11	..	2·864
B. O'Connor's Bessie of Oakvale	M.	16·3	3·5	·657
	E.	15·12	3·6	·660
	M.	17·12	3·6	·740
	E.	16·3	3·6	·677
		65·14	..	2·734
Jackson and Schofield's Irene of Bexley	M.	9·15	3·8	·437
	E.	10·6	4·9	·588
	M.	12·10	4·6	·680
	E.	11·8	5·1	·690
		44·7	..	2·395

COW OR HEIFER, UNDER 4 YEARS, AVERAGING THE GREATEST DAILY YIELD OF BUTTER FAT FOR 48 HOURS.

—	—	Milk.	Commercial Butter.	Points Butter Fat, 24 Hours.	Lactation Points.	Total Points.
		Lb.				
R. Mear's Tulip of Morden ..	M.	20·7	·977	..	..	..
	E.	17·3	·847	..	..	..
	M.	·20·15	·967	..	..	..
	E.	16·8	·760	..	..	..
		75·1	3·551	28·40	8·8	37·20
E. Burton's Oxford Golden Buttercup	M.	20·9	1·002	..	..	..
	E.	19·13	1·160	..	..	..
	M.	19·10	·895	..	..	..
	E.	14·13	1·225	..	..	..
		74·13	4·282	34·25	..	34·25

MILKING TESTS—*continued.*

——	—	Milk.	Commercial Butter.	Points Butter Fat, 24 Hours.	Lactation Points.	Total Points.
		Lb.				
B. O'Connor's Bessie of Oakvale	M.	16·3	·657	..	..	..
	E.	15·12	·660	..	..	..
	M.	17·12	·740	..	..	..
	E.	16·3	·677	..	..	..
		65·14	2·734	21·87	9·2	31·07
M. Lawrence's Present of City View	M.	19·4	·890	..	..	..
	E.	18·0	1·150	..	..	..
	M.	17·14	·725	..	..	..
	E.	19·1	1·093	..	..	..
		71·3	3·858	30·86	..	30·86
E. Burton's Oxford Noble Dot II.	M.	15·12	·680	..	..	..
	E.	17·4	1·297	..	..	..
	M.	15·9	·953	..	..	..
	E.	14·0	·860	..	..	..
		62·9	3·790	30·32	..	30·32
A. Pickels' Model of Blacklands..	M.	15·2	·593	..	..	..
	E.	14·7	·657	..	..	..
	M.	14·6	·585	..	..	..
	E.	14·7	·637	..	..	..
		58·6	2·472	19·77	9·3	29·07
M. Lawrence's 2nd of City View..	M.	10·14	·455	..	..	..
	E.	9·5	·359	..	..	..
	M.	11·10	·472	..	..	..
	E.	10·6	·435	..	..	..
		42·3	1·721	13·76	..	13·76

COW, UNDER 4 YEARS, GIVING BEST BUTTER FAT RESULTS, AND COMPETING IN THE TWO PREVIOUS SECTIONS, WITH ALLOWANCE FOR LACTATION POINTS IN THE LAST SECTION. THE POINTS SECURED BY THE VARIOUS COMPETITORS WERE SIMILAR TO THOSE IN THE CLASSES MENTIONED.

	Total points.
R. Mear's Tulip of Morden	37·20
R. Burton's Oxford Golden Buttercup	34·25
B. O'Connor's Bessie of Oakvale	31·07

COW YIELDING LARGEST SUPPLY OF MILK IN 48 HOURS.

——	—	Milk, Lb.	Test.
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie III. of Nestle's	M.	29·0	2·6
	E.	32·12	3·6
	M.	29·14	3·0
	E.	27·14	3·9
Total weight	..	119·8	..
B. O'Connor's Dahlia 2nd of Hillview	M.	28·15	3·1
	E.	26·4	3·2
	M.	29·10	3·0
	E.	27·7	3·2
Total weight	..	112·4	..

MILKING TESTS—*continued.*

—	—	Milk, Lb.	Test.
Livingstone Bros.' Young Duchess IV.	M.	24·6	3·0
	E.	20·1	4·0
	M.	26·6	3·7
	E.	21·8	3·9
Total weight		92·5	
S. H. Hosking's Duchess of Hanover of Berry	M.	28·4	2·3
	E.	28·4	2·9
	M.	30·0	2·7
	E.	28·15	3·4
Total weight		115·7	
(Above under Standard.)			
P. Moore's Lovely of Sunnyside	M.	23·9	2·8
	E.	16·13	5·1
	M.	21·7	4·8
	E.	21·0	4·1
Total weight		82·13	
M. Lawrence's Princess of City View	M.	22·10	3·7
	E.	19·11	4·2
	M.	22·0	3·6
	E.	18·0	4·9
Total weight		82·5	
M. Lawrence's Charmer II. of City View	M.	22·3	4·5
	E.	19·5	6·4
	M.	16·5	5·1
	E.	17·11	6·3
Total weight		75·8	

Special competition for Cows, 4 years old and over, averaging the greatest daily yield of butter fat for 48 hours, for which competition was conducted in the second of the foregoing classes.

	Commercial Butter.
A. Pickels' Royal 4th of Blacklands	5·983
M. Lawrence's Charmer 2nd of City View	4·916
Nestle and Anglo-Swiss Condensed Milk Co.'s Maggie 3rd of Nestles	4·557

ROYAL NATIONAL CHAMPION BUTTER FAT TEST FOR COW (ANY BREEDING), AVERAGING THE GREATEST YIELD OF BUTTER FAT, 48 HOURS (UNDER THE BABCOCK TEST), AND WHICH HAS BEEN THE PROPERTY OF THE EXHIBITOR THREE MONTHS BEFORE THE ENTRY. Special Prize of £25, and a cash prize of £2 2s. to the winner.

—	—	Milk, Lb.	Commercial Butter.	Points Butter Fat, 24 hours.	Lactation Points.	Total Points.
M. Lawrence's Charmer 2nd of City View (Illawarra Milking Shorthorn)	M.	22·3	1·180	..	..	..
	E.	19·5	1·451	..	..	..
	M.	16·5	·978	..	..	..
	E.	17·11	1·307	..	..	..
		75·8	4·916	39·32	10	49·32
Winner, 1920—						
B. O'Connor's Charm of Glenthorn (Illawarra)	..	121·8	6·76	..	..	..

CHAMPION BUTTER TEST.

The Royal National Champion Butter Fat Test for a £25 special prize and a cash prize of £2 2s. yearly to the winner, creates considerable interest among dairymen. The Prize is given for the cow of any breed averaging the greatest daily yield of butter fat for 48 hours under the Babcock test. This year the prize was won by Mr. Lawrence's Illawarra Milking Shorthorn, Charmer 2nd of City View. Previous winners were :— 1912, D. Dunn's Blossom III. ; 1913, McIntyre Bros.' Fancy ; 1914, A. Pickels' Florrie of Blacklands ; 1915, C. Bloss's Canary ; 1916, D. Dunn's Blossom III. ; 1917, Marquardt Bros.' Champion ; 1918, H. Benbow's Joyce ; 1919, no show held ; 1920, B. O'Connor's Charm of Glenthorn.

HOME MILKING.

Cows or heifers in all competitions averaging the greatest daily yield of butter fat for 48 hours, under Babcock test, milk to contain on an average not less than 3 per cent. of butter fat :—

		Milk. Lb.	Test.	Commercial Butter Fat.
Ayrshires.				
J. N. O. Anderson's Jeanette R. 3rd of Ivercauld ..	M.	26	3·8	1·16
	E.	25½	4·2	1·25
	M.	24½	5·2	1·49
	E.	25½	3·6	1·07
		101½	..	4·97
Livingstone Bros.' Young Duchess 4th	M.	31	3·0	1·08
	E.	23½	4·0	1·09
	M.	30	3·0	1·04
	E.	25	3·9	1·14
		109½	..	4·35
Jerseys.				
T. Mullen's Lady Lass 3rd	M.	21	4·8	1·18
	E.	20	5·2	1·22
	M.	20	5·2	1·22
	E.	24	5·0	1·42
		85	..	5·04
T. Mullen's Aldans Rosie	M.	20¼	5·8	1·385
	E.	21	4·5	1·11
	M.	22¼	5·4	1·415
	E.	21	4·4	1·08
		84½	..	4·990
Illawarra Milking Shorthorns.				
B. O'Connor's Charm of Glenthorn	M.	37·5	4·35	1·91
	E.	30·0	5·3	1·87
	M.	36·5	4·4	1·88
	E.	30·0	5·2	1·9
		134	..	7·56
M. Lawrence's Charm of 2nd of City View	E.	28½	3·6	1·19
	M.	30½	3·0	1·055
	N.	32	4·0	1·50
	E.	26½	4·4	1·365
	M.	30½	3·0	1·055
	N.	29	3·9	1·32
		177	..	7·485

HOME MILKING—*continued.*

—	—	Milk. Lb.	Test.	Commercial Butter Fat.
Friesians.				
P. P. Falt's Oakley Noreen	M.	31	4·2	1·53
	E.	30	5·0	1·77
	M.	30	5·6	1·98
	E.	31	5·0	1·82
		122	..	7·10
P. P. Falt's Dairymaid	M.	31	3·6	1·30
	E.	29	3·8	1·29
	M.	33	4·0	1·54
	E.	29	4·1	1·40
		122	..	5·33
G. Newman's Colantha Queen Segis	M.	33½	3·4	1·315
	E.	27½	4·3	1·385
	M.	32½	3·5	1·32
	E.	26½	4·3	1·335
		120	..	5·355
Grindles Ltd.'s Colantha Johanna Creamello ..	M.	28	3·45	1·13
	E.	32	3·00	1·11
	M.	31	3·00	1·08
	E.	29	4·70	1·60
		120	..	4·92

A special prize, awarded to the Queensland Stud Book cow or heifer of the four breeds in the Home Milking Competitions giving the best butter fat results, was awarded to B. O'Connor's Charm of Glenthorne (Illawarra).

BACON AND HAMS.

Mr. G. S. Stening (Sydney) judged the bacon, hams, and by-products, in the dairy produce section. J. C. Hutton Propty., Ltd., Brisbane, won the competitions in factory bacon, factory-cured hams, smoked sausages, and lard, gaining a high percentage of marks. The awards in the section are as follows :—

BACON, SIX SIDES, FACTORY CURED.

—	Flavour.	Texture and Firmness.	Portion of Fat and Lean.	Butchering and Finish.	Smoking.	Colour.	Total.
Possible points	45	10	10	10	10	15	100
J. C. Hutton Propty., Ltd., Brisbane	43	9	9½	7	9	13½	91
J. C. Hutton Propty., Ltd., Brisbane	43½	9	8½	7	9	13½	90½
Queensland Co-operative Bacon Co., Ltd., Murarrie	43½	8	9	8	8½	13	90
J. C. Hutton Propty., Ltd., Canterbury, N.S.W.	43	7	8	7	8	13	86
Foley Bros., Lismore, N.S.W. ..	42	6½	9	7	8	12½	85

BACON, FARMERS', TWO SIDES, CURED.

D. Dunn, Valley View, Beaudesert	42	8	8	7	7	13	85

BACON AND HAMS—*continued.*

—	Flavour.	Texture and Firmness.	Portion of Fat and Lean.	Butchering and Finish.	Smoking.	Colour.	Total.
HAMS, SIX, FACTORY CURED.							
J. C. Hutton, Propty. Ltd., Brisbane	43½	9	9	8½	9	13	92
J. C. Hutton Propty., Ltd., Brisbane	43½	8½	9	8½	9	13	91½
Queensland Co-operative Bacon Co., Ltd., Murarrie	43	8	8½	8½	9½	12½	90
J. C. Hutton Propty., Ltd., Canterbury, N.S.W.	43	7½	8½	8	9	12½	88½
Foley Bros., Ltd., Lismore, N.S.W.	42½	6½	7	8½	9	13	86½
HAMS, FARMERS' TWO BEST CURED.							
D. Dunn, Valley View, Beaudesert	42½	8	9	8	7	12½	87

LARD, IN BLADDERS, 14 Lb.

—	Flavour.	Texture.	Colour.	Finish and appearance.	Total.
Possible points	40	25	25	10	100
J. C. Hutton Propty., Ltd., Brisbane ..	37½	25	24½	10	97
Queensland Co-operative Bacon Co., Ltd., Murarrie	38	24½	23½	10	96
J. C. Hutton Propty., Ltd., Brisbane	37	20	24	10	91
Foley Bros., Ltd., Lismore, N.S.W.	36½	24	23	7	90

SAUSAGE, SMOKED, 14 Lb.

J. C. Hutton Propty., Ltd., Brisbane, 1.
Queensland Co-operative Bacon Co., Ltd., Murarrie, 2.

HEN EGGS, DOZEN, TO BE JUDGED BY WEIGHT.

J. G. Argo, Chermside, 1.
A. J. Cain, Spring Hill, 2.

JUDGE'S FAVOURABLE CRITICISM.

Satisfaction with the section was expressed by the judge, who remarked that the exhibits were of a fairly high order, and showed an improvement, both in quality and texture, on those of last year. The winning exhibit in bacon sides was exceptionally good, and would be difficult to excel, in so far as flavour and texture were concerned. Points were lost, however, in butchering, mainly caused by inferior scalding. The ham classes, too, were particularly good, and compared favourably with those of other shows. The minor exhibits, sausages and lard, were very fine in quality.

THE APIARY SECTION.

The Queensland Beekeepers' Association has benefited the apiary industry immensely by advocating and demonstrating the employment of modern methods and the application of science to honey production and extraction. Queensland honey ranks with the world's best for colour, flavour, and density. The industry is capable of great expansion, as many tons go to waste for lack of bees to gather it and beekeepers to harvest it. The competition in the extracted honey classes at the Show was very keen. An educative exhibit was a sectional view of a modern beehive, with a numbered descriptive chart attached. Two others by the same exhibitor, Mr. A. J. Wheeler, attracted much attention. One was a case showing the number of uses to which beeswax may be put, and a second demonstrated the medicinal value of honey.

THE AWARDS.

Extracted Honey.—Light: A. Smith 1, A. Douglas 2, A Gambling 3; golden: A. Gambling 1 and 2, P. Ward 3; dark: A. Gambling 1 and 2, W. K. Holmans 3; fine grain: A. Gambling 1, A. T. Baker 2, P. Ward 3; coarse: P. Ward 1 and 2, A. T. Baker, 3; comb and extracted: A. Douglas 1, S. L. Uhlmann 2, P. Ward 3; solid: P. Ward 1, A. T. Baker 2, A. J. Wheeler 3.; novice class: S. L. Uhlmann. Jar extracted honey: P. Ward. Comb honey, 12 1 lb. sections: A. Gambling. Frame of comb honey: P. Ward. Not less than 100 square inches: P. Ward. Beeswax, natural yellow: P. Ward; white: A. Smith. 4 lb. tablets: S. L. Uhlmann. Yellow tablets: P. Ward. Trophy form: A. Gambling. Modes of using beeswax: A. J. Wheeler. Trophy of apiary products: A. T. Baker 1, A. Gambling 2, A. Smith 3. Hives, &c.—Observatory hive: A. J. Wheeler; foundation for comb and sections: P. Ward. Honey cookery.—Honey vinegar: P. Ward. Collection of confectionery and cakes: Mrs. A. Pitkeathly. Articles showing medical use of honey: A. J. Wheeler. Champion prize for honey exhibited in classes 1, 2, 3, 8, and 9: Alex. Smith, Redbank.

FARM PRODUCE—THE AWARDS.

(Judges: Agricultural produce, Mr. H. C. Quodling; cotton, rubber, oils, &c., Mr. D. Jones.)

Cereals.—Maize, large yellow, period of maturity 5 to 6 months: J. H. Littleton 1 and 2; Yellow Dent (any district variety other than Hawkesbury champion or so-called Golden King): H. Franke; yellow peg tooth type (to include so-called "lady's finger," and long thin grains of this kind): H. C. Harvey 1, H. Franke 2; small yellow, period of maturity 100 to 120 days, Early Leaming (to include "Star" and "Gold Standard" Leaming): H. Franke 1, A. E. Price 2; Early Yellow Dent (or other distinct varieties): H. Franke; so-called 90-day, period of maturity 90 to 100 days: H Franke; white varieties, large white (Hickory King not eligible): H. Franke; Hickory King: C. Behrendorff; Boone County White (Silvermine, or other distinct white type): A. Loweke; Brazilian white: C. Behrendorff; red varieties, Sydney Red: H. Franke; Red Butcher: J. Stenzel 1 and 2; small Early Red (to include red-coloured Leaming, or any other early variety, with a distinct shade of red): H. Franke 1, H. C. Harvey 2; any variety, 10 lb.: H. Franke; popcorn any variety, 10 lb.: J. Donges; maize "ears," medium yellow: H. Franke; small yellow: H. Franke; any white variety: A. Loweke 1, H. Franke 2; red: H. Franke; red, small grain (early): A. E. Price 1, H. Franke 2; popcorn: J. Donges; champion best exhibit maize, yellow: J. H. Littleton; white champion: H. Franke. Wheat, medium, strong, flour wheat: Wm. Auchter; weak flour wheat, Wm. Auchter; grand champion prize best exhibit wheat, 2 bags, any variety: Wm. Bridge 1, G. Alexander 2 and 3. Barley, malting barley, 1 bushel (Chevalier or Battledoor type): Wm. Taylor 1, E. W. Jackson 2; malting barley, 1 bushel (Sea of Azov type): Wm. Taylor; Cape barley, 1 bushel: D. Hammond, 2; champion malting barley: Wm. Taylor. Oats, Algerian, or Sunrise oats, 1 bushel: C. Behrendorff 1, H. Franke 2. Hay, chaff, and ensilage, lucerne hay, best, dry, green coloured: B. C. Bell 1, J. Campbell 2; lucerne hay, sweated: J. Campbell; oaten hay: C. Behrendorff 1, J. Donges 2; wheaten hay: Wm. Auchter; Soudan grass hay: H. Franke 2; millet or panicum hay, any kind: H. Franke 2; 3 sheaves oaten hay, Algerian: H. W. Berlin 1, J. Donges 2; 3 sheaves oaten hay, Tartarian: H. W. Berlin; 3 sheaves wheaten hay: Wm. Auchter 1, H. W. Berlin 2; chaff, lucerne chaff, 1 bag, cut from prime, dry, green-coloured hay: H. W. Berlin 1, B. C. Bell 2; lucerne chaff, 1 bag, cut from prime, sweated hay: J. Campbell 1, J. Donges 2; wheaten chaff, 1 bag, best cut, screened, and bright, cut from prime hay: Leslie Auchter 1, Wm. Auchter 2; "canary" chaff, 1 bag, best cut, screened, and bright, cut from prime hay: H. Franke 2; Soudan grass, 1 bag, best cut, screened, cut from prime, fine stalked, leafy hay: H. Franke; millet or panicum chaff, 1 bag, any kind, cut from prime hay: K. Haag 1, H. W. Berlin 2; grass hay chaff, 1 bag, any kind, cut from artificial or native grasses: H. Franke 2; wheaten straw chaff, 1 bag: J. Campbell; straw chaff (any other kind): J. Campbell 1, H. Franke 2; ensilage (chaff), approx. 56 lb. maize, or other fodder: C. Behrendorff; green fodder, best collection, suitable for milch cows: H. Franke 1, J. Donges 2; agricultural and market garden seeds, sorghums and millet, grain sorghum non-saccharine), cream, standard or dwarf milo, 30 lb.: H. Franke 2; red Kafir corn, 30 lb.: H. Franke; saccharine, sorghums, saccaline (so-called), 30 lb.: E. J. Keys; sorghum saccharatum, 30 lb.: H. Franke; planter's friend (so-called imphee), 30 lb.: K. Haag 2; Amber cane, 30 lb.: K. Haag; Soudan grass, 30 lb.: H. Franke; panicum and fodder millets, white seeded French millet, 30 lb.: T. Fisher; Japanese millet, 30 lb.: H. W. Berlin 1, K. Haag 2; white panicum, 30 lb.: H. W.

Berlin. Pasture grass seeds.—Lucerne seed, Queensland grown, broad leaf, Hunter River variety, 30 lb.: C. Behrendorff 1, B. C. Bell 2; Sisal hemp fibre, one bundle, 3 to 4 in. in diameter: F. M. Schleger. Beans and peas, cowpeas (black), 30 lb.: K. Haag. Cowpeas (clay coloured), 30 lb.: K Haag. Yorkshire Hero peas or any other variety, 10 lb.: K. Haag. Miscellaneous.—Canary seed of commerce, 30 lb.: E. W. Jackson. Tropical produce.—Sugar-cane, five canes, any kind, with tops on, 16 months and under, grown in red soil: F. M. Schleger. Sugar-cane, 5 canes, any kind, with tops on, 16 months and under, grown in other than red soil: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, 5 canes, any kind, with tops on, standover: F. M. Schleger. Sugar-cane, collection good milling varieties, 3 canes of each variety, with tops on: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, stool, any kind, 16 months and under, standover: F. M. Schleger 1, Miers, Herman 2. Sugar-cane, stool, any kind, standover: F. M. Schleger. Sugar-cane, best 5 sticks D. 1135: F. M. Schleger. Sugar-cane, best 5 sticks, 1900 seedling: F. M. Schleger. Sugar-cane, best 5 sticks, any variety of Queensland or Hambledon seedlings, Badila, D. 1135 and 1900 seedling: F. M. Schleger. Sugar-cane, best 5 sticks, any variety of Queensland or Hambledon seedlings: F. M. Schleger. Cotton, upland, in seed, not less than 10 lb.: J. J. Kakebeeke. "The John Reid Crop," and prizes donated by Mrs. John Reid to encourage cotton cultivation in Queensland: J E. Maddox 1, J. J. Kakebeeke 2. Roots, &c., potatoes, blue varieties, Guyrar blues, coronations, or Commonwealths: T. Fisher 1, Louis Ebert 2. Manhattans: C. Seiler 1, Louis Ebert 2. Brownell, any variety other than Satisfaction: T. Fisher 1, H. Franke 2. Satisfaction: Louis Ebert 1, A. Loweke, 2; Scottish Triumphs: A. Loweke. Best collection, not less than six varieties, each 14 lb.: A. Loweke 1, Louis Ebert 2. Sweets, white table variety: Louis Ebert. Sweets, white cattle variety: Miers, Herman. Sweets, red or pink, table variety: J. S. Seeleither 1, Louis Ebert 2. Champion blue potato: T. Fisher. Champion white potato: A. Loweke. Champion Brownell potato: Louis Ebert. Crown pumpkins, table, 3: J. Seeleither 1, H. C. Harvey 2. Ironbark pumpkins, table, 3: H. C. Harvey 1, A. E. Price 2. Marrows, 3: A. E. Price. Piemelons, 3: J. Seeleither 1, Mrs. P. Newton 2. Arrowroot, 3 stools: Miers, Herman 1, H. Franke 2. chicory, green or dry, 10 lb.: J. Donges. Garlic, 3 lb.: F. Franke. Castor oil bean, any variety, 5 lb.: J. Donges. Swedes purple top, ½ cwt.: H. Franke 1, A. E. Price 2. Swedes, any other variety: H. Franke.

SWINE.

(Judge: Mr. W. Fisher.)

Improved Berkshires.—Boar, 2 years and over: W. J. Warburton's Northgate Item; over 6 months and under 1 year: E. Burton's Oxford King; under 6 months: J. H. Cowen's Cremorne Lad 1, J. H. Cowen's Cremorne Sonny 2; champion Berkshire boar, any age: W. J. Warburton's Northgate Item. Sow, 2 years and over: W. J. Warburton's Glad Eye; 1 year and under 2 years: C. Behrendorff's Brentwood Jill 1, Dr. H. B. Ellerton's Serang Maid 2; over 6 months and under 1 year: Dr. H. B. Ellerton's Goodna Queenie 1, E. Burton's Oxford Pearl 2; under 6 months: E. Burton's Oxford Marie 1, J. H. Cowen's Cremorne Bess 2; any age, with litter: E. Burton's Kilbirnie Lex; champion Berkshire sow: W. J. Warburton's Glad Eye.

Yorkshires.—Boar, 2 years and over: W. J. Warburton's Northgate My Lad 1, Queensland Agricultural College's Even Chance 2; 1 year and under 2 years: W. J. Warburton's Northgate Don 1; 6 months and under 1 year: Queensland Agricultural College; under 6 months, W. J. Warburton's boar; champion Yorkshire boar: W. J. Warburton's Northgate My Lad. Sow, 2 years and over: W. J. Warburton's Northgate My Girl; 1 year and under 2 years: W. J. Warburton's Northgate Glads; 6 months and under 1 year: W. J. Warburton's Trisa; under 6 months: W. J. Warburton's Rosetta; champion Yorkshire sow: W. J. Warburton's Northgate My Girl.

Tamworths.—Boar, 2 years and over: J. H. Whittaker's Meddlesome Duke; 1 year and under 2 years: Queensland Agricultural College's Knowle Chatham; 6 months and under 1 year: T. M. Hewitt; under 6 months: William Dredge's Rufus; champion Tamworth boar J. H. Whittaker's Meddlesome Duke. Sow, 2 years and over: J. H. Whittaker's Knowles Princess; 6 months and under 1 year: Queensland Agricultural College's Rosebank Doris 1, T. M. Hewitt 2; under 6 months: J. H. Whittaker's Knowles Gem 1, J. H. Whittaker's Knowles Pearl 2; champion Tamworth sow: J. H. Whittaker's Knowles Princess.

Poland-China.—Sow, 6 months and under 15 months: T. M. Hewitt; pen of three young boars, under 6 months: T. M. Hewitt; pen of three young sows, under 6 months: T. M. Hewitt.

Miscellaneous.—Special prize, presented by Mr. R. G. Watson, for Queensland-bred pig (sow or boar), under 6 months: E. Burton's Oxford Marie; 3 bacon pigs, any breed, 110 to 140 lb. estimated dressed weight: H. McNeilly 1, J. Fitzgerald 2; 3 porker pigs, 60 to 80 lb.: S. Mison 1, C. Bright 2; sow, with litter, any breed: E. Burton's Kilbirnie Lex; pen of 3 Berkshire sows, under 16 weeks: C. Behrendorff 1, E. Burton 2; pen of 3 Yorkshire sows, under 16 weeks: W. J. Warburton; pen of 3 Yorkshire boars, under 16 weeks: W. J. Warburton.

STUD SHEEP.

(Judge: Mr. Edgar Baynes.)

Lincolns.—Ram, any size: S. E. Pullen; ewe, any age: S. E. Pullen.

English Leicesters.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

Romney Marsh.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

Corriedales.—Ram, any age: J. H. Fairfax 1 and 2; ewe, any age: J. H. Fairfax 1 and 2.

Shropshires.—Ram, any age: S. E. Pullen; ewe, any age: S. E. Pullen.

BUTTER—EXPORT CLASSES.

The first prize went to the Queensland Farmers' Co-operative Co., Ltd., of Laidley, with 93½ points for salted butter and 92½ points for unsalted butter. The details are as follows :—

ONE BOX (SALTED), 30 DAYS' STORAGE.

—	Flavour.	Texture.	Colour.	Salting.	Packing and finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Co., Ltd., Laidley	59	19½	7	4	4	93½
Downs Co-operative Dairy Co., Ltd., Toowoomba	58½	19½	7	4	4	93
Murrumbidgee Irrigation Areas, Leeton, N.S.W.	58	19½	7	4	4	92½
Logan and Albert Co-operative Dairy Co., Ltd., Beaudesert	54	19	7	4	4	88
Terror's Creek and Samson Vale Dairy Co., Dayboro	56	19	7	4	3½	89½
Downs Co-operative Co., Ltd., Dalby ..	56	19	7	4	4	90
Downs Co-operative Co., Ltd., Clifton ..	56½	19	7	4	4	90½
Downs Co-operative Co., Ltd., Crow's Nest	57	19	7	4	4	91
Caboolture Co-operative Dairy Co., Ltd. Pomona	56	19	7	3	4	89
Gayndah Co-operative Dairy Co., Ltd., Gayndah	57	19	7	4	3½	90½
Oakey Co-operative Dairy Col, Ltd., Oakey	56½	19	6½	4	4	90
Queensland Farmers' Co-operative Co., Ltd., Booval	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Co., Ltd., Boonah	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Co., Ltd., Grantham	58	19	7	4	4	92

BUTTER—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N.S.W.	56½	19	7	4	4	90½
Maryborough Co-operative Dairy Co. Ltd., Maryborough	54	19	7	4	4	88
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56½	19	7	4	4	90½
Maryborough Co-operative Dairy Co. Ltd., Biggenden	56½	19	7	4	3½	90
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	56	19	7	3	3½	88½
Wide Bay Co-operative Dairy Co. Ltd., Gympie	56	19	7	3½	3½	89½
Wide Bay Co-operative Dairy Co. Ltd., Cooroy	57	19	7	3½	3½	90
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin	56½	19	7	4	3½	90
Warwick Butter and Dairying Co. Ltd., Mill Hill	56	19	7	4	3½	89½
Warwick Butter and Dairying Co. Ltd., Allora	57	19	7	4	3	90
Warwick Butter and Dairying Co. Ltd., Texas	56	18½	7	4	3	88½
Nanango Co-operative Dairy Co. Ltd., Nanango	56	19	7	4	4	90

ONE BOX (UNSALTED), 8 WEEKS' STORAGE.

—	Flavour.	Texture.	Colour.	Packing.	Total.
Possible points	65	24	7	4	100
Queensland Farmers' Co-operative Dairy Co. Ltd., Boonah	58	23½	7	4	92½
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	58	23	7	4	92
Queensland Farmers' Co-operative Co., Booval ..	57½	23	7	4	91½
Logan and Albert Co-operative Dairy Co. Ltd., Beaudesert	57	23	7	4	91
Terror's Creek and Samson Vale Dairy Co., Dayboro	56½	23	7	3½	90
Downs Co-operative Dairy Co. Ltd., Toowoomba	57	22½	7	4	90½
Downs Co-operative Dairy Co. Ltd., Dalby ..	56	23	7	4	90
Caboolture Co-operative Dairy Co. Ltd., Pomona	56	23	7	4	90
Gayndah Co-operative Dairy Co. Ltd., Gayndah	57	23	7	4	91
Oakey Co-operative Dairy Co. Ltd., Oakey ..	56½	23	7	4	90½
Queensland Farmers' Co-operative Co. Ltd., Grantham	57	23	7	4	91
Queensland Farmers' Co-operative Co. Ltd., Laidley	56½	23	7	4	90½
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N.S.W.	56	23	7	4	90
Maryborough Co-operative Dairy Co. Ltd., Maryborough	56½	23	7	4	90½
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56	23	7	4	90

BUTTER—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Packing.	Total.
Possible points	65	24	7	4	100
Maryborough Co-operative Dairy Co. Ltd., Biggenden	57	23	7	3	90
Wide Bay Co-operative Dairy Co. Ltd., Gympie ..	56	23	7	4	90
Wide Bay Co-operative Dairy Co. Ltd., Cooroy ..	55	23	7	4	89
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin ..	55½	23	7	4	89½
Warwick Butter and Dairying Co. Ltd., Mill Hill ..	56	23	7	4	90
Warwick Butter and Dairying Co. Ltd., Allora ..	55	23	7	3	88
Warwick Butter and Dairying Co. Ltd., Texas ..	55½	23	7	3	88½
Warwick Butter and Dairying Co. Ltd., Goondiwindi	56	23	7	4	90

ONE BOX (SALTED), 8 WEEKS' STORAGE.

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Dairy Co. Ltd., Boonah	58½	19	7	4	4	92½
Queensland Farmers' Co-operative Dairy Co., Ltd., Booval	58	19	7	4	4	92
Wide Bay Co-operative Dairy Co. Ltd., Cooroy	57½	19	7	4	4	91½
Logan and Albert Co-operative Dairy Co., Goombungee	57	19	7	4	4	91
Queensland Farmers' Co-operative Dairy Co. Ltd., Grantham	57	19	7	4	4	91
Queensland Farmers' Co-operative Dairy Co. Ltd., Laidley	56½	19	7	4	4	90½
Dorrigo Co-operative Dairy Co. Ltd., Dorrigo, N. S. W.	56½	19	7	4	4	90½
Downs Co-operative Dairy Co., Ltd., Crow's Nest	56½	19	7	4	4	90½
Terror's Creek and Samson Vale Dairy Co., Dayboro	57	19	7	4	3	90
Oakey Co-operative Dairy Co. Ltd., Oakey	56	19	7	4	4	90
Downs Co-operative Dairy Co. Ltd., Toowoomba	56	19	7	4	4	90
Downs Co-operative Dairy Co. Ltd., Dalby	56	19	7	4	4	90
Kin Kin Co-operative Dairy Co. Ltd., Kin Kin	55½	19	7	4	4	89½
Downs Co-operative Dairy Co. Ltd., Clifton	55½	19	7	4	4	89½
Maryborough Co-operative Dairy Co. Ltd., Kingaroy	56	19	7	3½	4	89½
Warwick Butter and Dairying Co. Ltd., Mill Hill	56	19	7	3	4	89
Wide Bay Co-operative Dairy Co. Ltd., Gympie	55	19	7	4	4	89
Maryborough Co-operative Dairy Co. Ltd., Maryborough	55½	19	7	3½	4	89
Gayndah Co-operative Dairy Co. Ltd., Gayndah	55	19	7	4	3½	88½
Maryborough Co-operative Dairy Co. Ltd., Biggenden	55½	19	7	3½	3½	88½
Warwick Butter and Dairying Co. Ltd., Goondiwindi	55	19	7	4	3½	88½
Caboolture Co-operative Dairy Co. Ltd., Pomona	55	19	7	4	3	88
Maryborough Co-operative Dairy Co. Ltd., Mundubbera	54½	19	7	3½	4	88
Warwick Butter and Dairying Co. Ltd., Texas	55	19	6½	4	3½	88
Warwick Butter and Dairying Co. Ltd., Allora	55	18½	7	3	4	87½

BUTTER FOR LOCAL MARKETS.

In the factory butter class (local consumption) the Queensland Farmers' Co-operative Dairy Co., Boonah, came first with 93½ points; they also secured the special prize of £5 5s. for the factory securing the greatest aggregate number of points in all classes of butter. Caboolture Co-operative Dairy Co., Ltd., Pomona, second, with 93 points; and Kin Kin Co-operative Dairy Co., Ltd., Kin Kin, third, with 92½ points.

Details are as follows :—

ONE BOX, FACTORY MAKE, LOCAL CONSUMPTION.

—	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points	65	20	7	4	4	100
Queensland Farmers' Co-operative Co., Boonah	59½	19	7	4	4	93½
Caboolture Co-operative Dairy Co., Pomona	59	19	7	4	4	93
Kin Kin Co-operative Dairy Co., Kin Kin	58½	19	7	4	4	92½
Maryborough Co-operative Dairy Co., Kingaroy	58	19	7	4	4	92
Warwick Butter and Dairying Co., Goondiwindi	58	19	7	4	4	92
Terror's Creek and Samson Vale Dairy Co., Dayboro	58½	19	7	4	3	91½
Queensland Farmers' Co-operative Co., Laidley	57½	19	7	4	4	91½
Wide Bay Co-operative Dairy Co., Gympie	58	19	7	3½	4	91½
Warwick Butter and Dairying Co., Mill Hill	57½	19	7	4	4	91½
Nanango Co-operative Dairy Co. Ltd., Nanango	57½	19	7	4	4	91½
Logan and Albert Co-operative Dairy Co., Beaudesert	57	19	7	4	4	91
Wide Bay Co-operative Dairy Co., Cooroy	57	19	7	4	4	91
Downs Co-operative Dairy Co., Toowoomba	57½	19	7	3½	4	91
Downs Co-operative Dairy Co., Clifton ..	57	19	7	4	4	91
Astonville Co-operative Dairy Co., Astonville	57	19	7	4	4	91
Queensland Farmers' Co-operative Co., Booval	56½	19	7	4	4	90½
Queensland Farmers' Co-operative Co., Grantham	57	19	7	3½	4	90½
Maryborough Co-operative Dairy Co., Maryborough	57	19	7	3½	4	90½
Warwick Dairy and Butter Co., Allora ..	57	19	7	4	3½	90½
Downs Co-operative Dairy Co., Crow's Nest	56½	19	7	4	4	90½
Gayndah Co-operative Dairy Co., Gayndah	56½	19	7	3½	4	90
Oakey Co-operative Dairy Co., Oakey ..	56	19	7	4	4	90
Maryborough Co-operative Dairy Co., Mundubbera	56	19	7	3½	4	89½
Downs Co-operative Dairy Co., Dalby ..	56	19	7	4	3½	89½
Maryborough Co-operative Dairy Co., Biggenden	55	19	7	3½	3½	88

BUTTER FOR LOCAL MARKETS—*continued.*

GREATEST AGGREGATE NUMBER OF POINTS.

Special prize of £5 5s. for factory securing the greatest aggregate number of points in all classes of butter.

—	Export Butter.	8 Weeks' Storage.	Box Butter.	Fresh Butter.	Total.
Queensland Farmers' Co-operative Co., Boonah ..	92	92½	92½	93½	370½
Queensland Farmers' Co-operative Co., Booval ..	92	91½	92	90½	366
Queensland Farmers' Co-operative Co., Laidley ..	93½	90½	90½	91½	366
Queensland Farmers' Co-operative Co., Grantham	92	91	91	90½	364½
Downs Co-operative Dairy Co., Toowoomba ..	93	90½	90	91	364½
Kin Kin Co-operative Dairy Co., Kin Kin ..	90	89½	89½	90½	361½
Wide Bay Co-operative Dairy Co., Cooroy ..	90	89	91½	91	361½
Logan and Albert Co-operative Dairy Co., Beaudesert	88	91	91	91	361
Terror's Creek and Samson Vale Dairy Co., Dayboro	89½	90	90	91½	361
Oakey Co-operative Dairy Co., Oakey	90	90½	90	90	360½
Caboolture Co-operative Dairy Co., Pomona ..	89	90	88	93	360
Gayndah Co-operative Dairy Co., Gayndah ..	90½	91	88½	90	360
Wide Bay Co-operative Dairy Co., Gympie ..	89½	90	89	91½	360
Warwick Butter and Dairying Co., Mill Hill ..	89½	90	89	91½	360
Downs Co-operative Dairy Co., Dalby	90	90	90	89½	359½
Maryborough Co-operative Dairy Co., Maryborough	88	90½	89	90½	358
Maryborough Co-operative Dairy Co., Mundubbera	88½	92	88	89½	358
Maryborough Co-operative Dairy Co., Biggenden	90	90	88½	88	356½
Warwick Butter and Dairying Co., Allora ..	90	88	87½	90½	356
Maryborough Co-operative Dairy Co., Kingaroy..	90½	90	89½	92	352
Downs Co-operative Dairy Co., Crow's Nest ..	91	..	90½	90½	272
Downs Co-operative Dairy Co., Clifton	90½	..	89½	91	271
Dorrigo Co-operative Dairy Co., Dorrigo, N.S.W...	90½	90	90	..	271
Warwick Butter and Dairying Co., Goondiwindi	..	90	88½	92	270½
Warwick Butter and Dairying Co., Texas ..	88½	88½	88	..	265

CHEESE—EXPORT CLASSES.

The following are details of the points awarded :—

Two Export Cheeses, 70-80 lb. (not more than three weeks' old prior to storing). White, suitable for English market :—

—	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points	50	25	15	10	100
Goombungee Co-operative Dairy Co., Goombungee	43½	25	15	9	92½
Downs Co-operative Dairy Co. Ltd., Hodgson's Vale	42½	25	15	9½	92
Biddeston Co-operative Dairy Co. Ltd., Wellcamp	42½	25	14½	9½	91½
Kooroongarra Co-operative Dairy Co. Ltd., Kooroongarra	42	25	15	9½	91½
Pittsworth Dairy Co. Ltd., Pittsworth	42	24	15	9½	91
Gayndah Co-operative Dairy Co. Ltd., Byrnestown	43	24	14½	8½	90

CHEESE—EXPORT CLASSES—*continued.*

—	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points	50	25	15	10	100
Greenmount Dairy Co. Ltd., "H." Factory ..	42	24	14½	9½	90
Greenmount Dairy Co. Ltd., "G" Factory ..	42	24	15	9	90
Warwick Butter and Dairying Co. Ltd., Bony Mountain	41	24	14	9	88
Oakey Co-operative Dairy Co. Ltd., Cross Hill ..	41	24	14½	8	87½
Two Export Cheeses, 70-80 lb. (not more than three weeks' old prior to storing). Coloured, suitable for English market :—					
Pittsworth Dairy Co. Ltd., Pittsworth	44	25	15	9½	93½
Downs Co-operative Dairy Co. Ltd., Hodgson's Vale	44½	25	14	9½	93
Pittsworth Dairy Co. Ltd., Brookstead	43	25	15	9½	92½
Goombungee Dairy Co. Ltd., Goombungee ..	43	24½	15	9½	92
Greenmount Dairy Co. Ltd., "H" Factory ..	43	24½	15	9½	92
Greenmount Dairy Co. Ltd., "G" Factory ..	42½	25	15	8½	91
Southbrook Co-operative Dairy Co. Ltd., Southbrook	41	25	15	9	90
Kooroongarra Co-operative Dairy Co. Ltd., Kooroongarra	42	24½	14	9½	90
Warwick Butter and Dairying Co. Ltd., Victoria Hill	41	24½	15	9½	90
Warwick Butter and Dairying Co. Ltd., Bony Mountain	40½	25	15	9	89½
Warwick Butter and Dairying Co. Ltd., Pratten	41	24½	14½	9½	89½
Gayndah Co-operative Dairy Co. Ltd., Byrnestown	41	24	14	9	88
Karrajong Cheese Factory, Jimbour	39	24	14	8½	85½
Oakey Co-operative Dairy Co., Cross Hill ..	40	24	14	8½	85½
Downs Co-operative Dairy Co., Gowrie Junction ..	38	24½	14½	9	86
Biddeston Co-operative Dairy Co., Wellcamp ..	38	24½	14½	8½	85½

SHOW LECTURES.

Dairy cattle breeders and others interested attended in large numbers two informative lectures under the presidency of Mr. W. J. Affleck in the course of Show week.

THE DAIRY PRODUCE ACT.

Mr. E. Graham, Chief Dairy Expert, lectured on the new Dairy Produce Act. He pointed out that it superseded the "*Dairy Produce Acts*, 1904-11." The need for the new legislative measure was occasioned by the advancement that had been made in dairying during the latter years as a result of the improvement and the introduction of additional scientific measures. In framing the Act care was taken to inquire into the measures that governed dairying in other countries. In the main, the 1920 Act contained all that was found useful and beneficial to the industry in the 1904 Act. In addition, some further provisions had been added which it was thought would be for the betterment of the industry. Amongst the principal alterations was that dealing with registrations of dairies. Formerly registration was an annual matter, but under the new Act when a dairy was once registered the registration would remain in force indefinitely. The new Act further required that those engaged in dairy work might be called upon to produce a certificate of good health. Cream manifestly affected by putrefactory decomposition was not to be received for the manufacture into butter, and cream containing more than .66 per cent. of lactic acid should not be classified as first grade in quality for butter-making, and milk containing more than .25 per cent. of lactic acid should not be classified as first-grade quality for cheesemaking. Apparatus for cleaning the hands of the milkers

and udders of the dairy cows was to be provided. A notice of epizootic or contagious disease amongst stock was required. Factories manufacturing dairy produce were required under the Act to distribute any overrun made by them *pro rata* each month amongst those supplying milk or cream. There had been, too, an alteration in the standard for cream for certain months of the year. Those were the principal alterations of the Act. While it was recognised they were to a great extent minor, they should not alarm those who had the interests of the industry at heart, and desired to assist in the maintenance of the good reputation of this State as a producer in dairy foodstuffs.

DISEASES OF DAIRY CATTLE.

The prevention of disease in dairy cattle with special reference to contagious mammitis was dealt with by Mr. McEachern, a qualified veterinary surgeon. In introducing the subject, the lecturer spoke of the importance of the live stock industry. The necessity for healthy, thrifty calves was mentioned, and the various methods of raising calves described. Ailments of calves dealt with included scours, pneumonia, hæmorrhagic septicæmia, and blackleg, and preventive and curative measures were fully explained. Common milk defects were mentioned, and causes given, and some time was devoted to the different forms of mammitis encountered in dairy cows, such as the simple, tubercular, actinomycotic, and contagious. The latter was described as a most disastrous disease, which was of such an insidious character that it was possible for a whole herd to be affected before the owner realised the nature of the trouble. Prevention was better than cure, and if we could check the occurrence of disease by hygienic measures, the country and stockowners would benefit proportionately.

TREATMENT FOR SMALL WORMS IN HORSES.

Sclerostoma Tetracanthum.—This is a small thread-like worm about half an inch long, found chiefly in the large bowel in great numbers. The embryos encyst themselves beneath the mucous membrane. The countless wounds which the worms make in the bowel, and the irritation caused by the encysted larvæ, give rise to enteritis, &c. There is usually associated with this worm another known as the *Sclerostoma equinum.* This worm is about 1¼ inches to 1½ inches long, grey or reddish grey in colour, with a round knobbish head, and tapering to the tail end. The embryos wander into the blood vessels, causing obstructions giving rise to grave complications.

Treatment.—All suspected animals should be purged by administering a dose of physic, such as 5 to 6 drachms of powdered Barbados aloes with one drachm of powdered ginger given as a drench in a pint of thin gruel, or made into a ball with a little soft soap. After the action of the purgative has ceased, they should be given every day, about one hour before their morning feed, the following powder mixed in a couple of handfuls of damped food:—

Antimony tartrate	2 drachms
Powdered sulphate of iron	1 drachm
Powdered gentian	2 drachms
Powdered aniseed	3 drachms

After six doses they should be given a second active purgative, for the smaller horses and ponies not more than 5 drachms of aloes and 1 drachm antimony tartrate should be given. During the treatment the animals should be kept yarded to prevent the contamination of pastures by excreta, which should be gathered up and burnt, and the ground dressed with common salt or quick lime. As infested animals cannot by one course of vermifuges be divested of the larvæ in the cysts and blood vessels, they should be treated at intervals of two or three months. More important than medication is the exclusion of embryos from food and water.

Wherever the *Sclerostoma* have secured a local habitat the land should be put under a rotation of crops, to be laid down in grass again after four or five years. The *Sclerostoma* ova will by this time have hatched out and died a natural death. Where this is impracticable, change the horses to other pastures and depasture the infested land for several years by cattle or sheep, which do not harbour the *Sclerostoma.* In all cases it must be provided that no drainage can come from infested pastures to the clean pastures. Rock salt left in the paddocks for the horses to lick will greatly minimise the chances of infestation.

Pastoral.

THE NODULE PARASITE AND ALLIED WORMS FROM QUEENSLAND CATTLE.

By PROFESSOR T. HARVEY JOHNSTON, University, Brisbane.

In the "Queensland Agricultural Journal" of December, 1911, the writer gave a brief account of the "worm nodule disease" (*Onchocerciasis*) of Queensland cattle. At that time it was not known that in addition to the parasite, *Onchocerca gibsoni*, Cleland and Johnston, which causes that condition, there were other allied worms infesting our stock. Last year attention was called by M. J. Bancroft and the writer to a second species, which was then identified as *O. bovis*, Piettre, but which is now regarded as belonging to *O. gutturosa*, Neumann. A third species, *O. lienalis*, Stiles, is reported for the first time as a common parasite of Queensland cattle. Of these, the firstnamed is of very great economic importance; the second of very little; and the third, probably none.

I. Onchocerca Gibsoni, Cleland and Johnston.

The worm nodule parasite has caused very heavy loss to the Queensland meat export trade. Official figures supplied by the Commonwealth authorities (*see* Bulletin No. 2, Institute of Science and Industry, 1917) regarding the number of briskets examined during 1914, 1915, and 1916 in Queensland coastal meatworks show that about 80 per cent. were infected with nodules in North Queensland, 63 per cent. in Central Queensland works, and 70 per cent. (1914, 1915) in south-eastern meatworks. The number of cattle killed in this State during the period averaged about half a million head annually. The actual loss per average carcase of 650 lb. dressed weight intended for export was estimated during 1916 to be about 19s., as about 15 per cent. of the carcase, on an average, had to be removed, owing to its infected condition, before export was permitted by the Commonwealth authorities. Though the part so removed was utilised in other ways, yet the cost of removal and the diminished value of the excised portion involved a loss averaging nearly £1 for each carcase. The worm nodule parasite, then, must have cost Queensland nearly half a million sterling annually during the period referred to. It is only by quoting such figures that the public can be made to realise what a great loss has occurred, and is still occurring, to one of the great primary industries of this State. It is certainly surprising that, apart from certain investigations carried out several years ago at the Townsville Tropical Institute by Drs. Breinl and Nicoll, and those conducted by myself and staff in the University, Brisbane, practically no research relating to this important subject has been attempted in this State. The Commonwealth Government has subsidised in a small way some work carried out in New South Wales and Northern Territory. The earlier work of Dr. Cleland and the writer (1909-1911) was performed whilst in the service of the New South Wales Government. There is urgent need for the State authorities to undertake work, seeing that Queensland is the country most concerned in the problem. Such research work should be paid for by the community, and should be carried out by special research workers, properly qualified, controlled either by the Department of Agriculture or else, preferably for the independence of the researches, at the University.

The nodules, which occur especially in the brisket and stifle joint, vary somewhat in shape and size, but are generally of rounded outline, often flattened on two sides, and measuring from less than an inch to as much as four inches in their greatest length. Near the centre of each "worm nest" there lies a long, closely coiled female worm, 20 to 56 inches in length, with which there may be associated one or more small males, 1½ to 2 inches long. The surrounding mass of fibrous tissue, which constitutes the bulk of the nodule, is really a reaction on the part of the adjacent tissues of the host against the presence of the parasite. Ultimately the latter dies, disintegrates, and undergoes calcification, but the nodule remains.

The female worm has its exterior ornamented by the presence of cuticular ridges wound spirally round the body. The degree of prominence and the closeness of these ridges to one another vary in the different parts of the body, but are fairly constant on the thickest part, the midregion of the worm. They differ, however, in the different species of *Onchocerca* and are used as a means for differentiating these parasites of

connective tissue, which are known to infest bovines, the camel, horse, and man. Sometimes the parasite shows a preference for a particular situation in its host animal, *e.g.*, one species invades the tendons of the horse's foot, while another parasitises the neck ligament, whereas in cattle one is especially common in the brisket (*O. gibsoni, O. indica*), another in the neck ligaments and certain other situations (*O. gutturosa*), another in various joints (*O. bovis*), another in the vicinity of the spleen (*O. lienalis*), and another in the aortic walls (*O. armillata*); a related worm, *Elæophora poeli*, belonging to the *Onchocercinæ*, also occurs in this situation, the last-mentioned two occurring in South-eastern Asia and adjacent islands. In all cases the *Onchocerca* parasites invade connective tissue.

The most important matter from the economic standpoint is the prevention of infection. But this presupposes a knowledge of the life history of the worm before it enters the ox. In other words, by what means is the parasite transmitted from ox to ox? How does it enter the bovine? Is it carried by some kind of blood-sucking insect, such as a mosquito, midge, louse, march fly (*Tabanid*) or other biting fly, or by a tick, *e.g.*, one of the cattle ticks (*Boophilus australis, Rhipicephalus sanguineus*); or is it transmitted by some aquatic organism? It is not likely to be transferred directly from ox to ox without the assistance of some intermediary. Though a great deal of experimental work has been carried out in New South Wales, Northern Territory, and this State, all results have as yet been negative. It can be safely stated that so far we have no knowledge as to what kind of organism acts as the necessary transmitting agent; and until that is known, one cannot hope to formulate successful measures for the protection of stock against this extremely common worm parasite. In the case of a related filarial worm (*Filaria bancrofti*) which very frequently infests human beings in Brisbane, it is known that certain mosquitoes which breed in abundance in the surrounding districts can readily act as transmitters; in fact, such insects are necessary agents, as infection would not occur without their help, since certain early stages in the life history of the parasite must be passed through within the mosquito, the early larvæ of the worm gaining access to the mosquito when the latter sucks up infected human blood, the fully developed larvæ invading the human body at a later date when the mosquito again feeds on human blood. Hence the disease human filariasis (including elephantiasis) can be controlled (1) by enforcing efficient measures for the destruction of mosquitoes, especially during the larval stage, when they may be most readily and effectively attacked and destroyed; and (2) by preventing mosquitoes from gaining access to infected patients (especially at dusk or evening), and thus becoming potential sources of infection to other people after the period necessary for the development of the worm-larvæ within the mosquito has elapsed.

These remarks should emphasise the importance of having research work carried out, having in view the discovery of the transmitting agent or agents of cattle *Onchocerciasis*, such work to be followed up, if necessary, by a study of the biology of the transmitters in order to ascertain the most advantageous time to attempt to control it, and thus indirectly control the spread of *Onchocerca gibsoni*. This parasite is not restricted to Australia; but occurs in the East Indies and South-eastern Asia also, while a closely related worm (*O. indica*) is found in cattle in India.

II. ONCHOCERCA GUTTUROSA, Neumann.

The second species, present in cattle in New South Wales and especially in Queensland, is now determined as *O. gutturosa*. A related, or perhaps identical, species infests cattle in the Argentine Republic and Uruguay (where it is called *O. bovis*), and in the United States of America. The parasite was originally described as occurring commonly in the neck ligament of cattle in Northern Africa (Algeria, Tunisia). In Australian bovines it is to be found in the ligament in the region between the first and fifth dorsal vertebrae as well as in the vicinity of the trochanter, and at times the stifle joint also. Though so common in this State (probably 50 per cent. or more of cattle killed at abattoirs being infected), its presence was not recorded until last year, when M. J. Bancroft and the writer reported it.

The lesions caused by this worm are much less obvious than those set up by *O. gibsoni*. Nodule formation is either absent or much less obvious, though a certain amount of fibrosis takes place. The female worms are much less intricately coiled, considerably thinner, and with ridges less prominent and much further apart than in the former species. Between the spiral ridges there are about four striæ, whereas in *O. gibsoni* there are only two. The distance between ridges in the midregion of the body is about one-third to two-fifths of the midbody diameter, whereas in the former species it is from one-tenth to one-eighth. The male of *O. gutturosa* is rather smaller.

Degeneration and calcification occur after the death of the worms. Owing to the sites of infection and the usually comparatively small lesions caused, this species has little economic importance.

III. ONCHOCERCA LIENALIS, Stiles.

This third species infesting Queensland cattle is to be found in the gastro-splenic ligament, close to the spleen, where the female worm appears as a long whitish thread enclosed in a delicate tunnel of connective tissue, the whole so resembling a nerve or empty blood vessel at first sight that its presence has been completely overlooked until now, this constituting the first record of its presence outside the United States, as far as the writer is aware. It is very commonly met with in Brisbane abattoirs as well as elsewhere in the State.

A specimen measured in Brisbane reached 17 inches in length, but its maximum breadth was only one-hundredth of an inch. This species possesses very low cuticular ridges, situated rather close together, their distance from each other in the midbody of a female being equal to about one-fifth of the maximum body diameter. There are two striæ between adjacent spirals.

O. lienalis appears to have no economic significance in regard to meat inspection.

It is reasonable to expect that similar agents, not necessarily specifically identical, will be found to act as transmitters of these three species of *Onchocerca*, whose common and widespread occurrence suggests that the transmitting agents must also be very common and widespread.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JULY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1921.	July, 1920.		July.	No. of Years' Records.	July, 1921.	July, 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·88	20	1·24	1·04	Nambour	2·56	25	6·66	2·72
Cairns	1·61	39	1·64	2·32	Nanango	1·72	39	3·52	3·13
Cardwell	1·44	49	2·49	3·25	Rockhampton ...	1·37	34	5·81	0·83
Cooktown	1·00	45	1·19	1·31	Woodford	2·43	34	5·37	1·99
Herberton	0·64	34	2·40	0·88					
Ingham	1·57	29	3·64	3·81					
Innisfail	4·71	40	7·33	7·89					
Mossman	1·57	13	1·28	3·68					
Townsville	0·52	50	3·45	0·27	*Darling Downs.*				
					Dalby	1·79	51	3·30	3·36
Central Coast.					Emu Vale	1·44	25	5·77	3·45
					Jimbour	1·70	33	2·04	3·46
Ayr	0·53	34	5·68	0·42	Miles	1·79	36	2·25	3·67
Bowen	0·91	50	2·77	1·17	Stanthorpe ...	1·93	48	8·07	3·11
Charters Towers ...	0·53	39	2·85	0·37	Toowoomba ...	2·00	49	5·33	4·03
Mackay	1·59	50	7·19	0·93	Warwick	1·77	34	6·32	3·73
Proserpine	1·04	18	8·08	1·44					
St. Lawrence ...	1·20	50	4·45	0·80					
					Maranoa.				
South Coast.					Roma	1·41	47	6·88	3·24
Biggenden	1·25	22	2·62	1·59					
Bundaberg	1·89	38	2·88	1·87	*State Farms, &c.*				
Brisbane	2·28	70	6·14	2·19					
Childers	1·59	26	3·93	1·49	Bungeworgorai ...	1·14	7	7·05	3·03
Crohamhurst ...	2·43	26	7·85	2·60	Gatton College ...	1·31	22	4·12	2·55
Esk	1·93	34	4·24	3·76	Gindie	1·06	22	2·85	1·23
Gayndah	1·47	50	2·78	1·18	Hermitage ...	1·50	15	6·37	4·07
Gympie	2·11	51	5·40	1·97	Kairi	1·10	7	...	1·78
Glasshouse M'tains	2·08	13	6·62	2·47	Sugar Experiment Station, Mackay	1·28	24	6·97	0·82
Kilkivan	1·69	42	2·22	1·32	Warren	0·68	7	5·42	0·91
Maryborough ...	1·93	50	3·46	1·58					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for July this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

The Horse.

CERTIFICATES OF SOUNDNESS.

List of Stallions registered and certified as sound, in the course of the month of July :—

Name of Horse.	Owner.	Address.
	DRAUGHT HORSES.	
Donald Crystal (L) ..	L. E. Walker	Brisbane
Prince of Invermay ..	G. Elliott	Laidley South
	BLOOD HORSES.	
Roseacre (L)	Wilson and McDouall ..	Calliope, Gladstone
Hopost (L)	W. Hayes	Mount Stanley, Linville, Esk
Had-I-Wist (L)	L. E. Walker	Brisbane
	TROTTERS.	
Fred Cahill (L)	Nurse Walsh	Earl street, Normanby, Brisbane
Rexie	E. Tuke	Rocklea
Dexter	F. Noffke	Glenore Grove, Forest Hill
Little King Cole ..	S. Morris	Ottaba, *viâ* Esk
Cole King	T. K. Fitzgerald	Samford
	PONIES.	
Laddie (L)	S. C. Dahlin	Doggett street, Valley, Brisbane
Young Wiltrim (L) ..	W. Mewett	Kilcoy

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR JULY, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Bellona	Ayrshire ...	26 June, 1921	1,423	3·6	56·83	
Prim	Holstein ...	9 Mar. ,,	1,251	3·6	50·00	
College Cold Iron	Jersey ...	10 Mar. ,,	889	4·6	46·01	
Wattle Blossom ...	Guernsey ...	24 May ,,	662	5·4	42·42	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	992	3·6	39·84	
College Mignon ...	Jersey ...	7 July ,,	605	4·5	30·50	
Miss Betty ...	,, ...	7 ,, ,,	613	4·4	30·25	
Charming Damsel	Ayrshire ...	12 May ,,	659	3·8	27·92	
Iron Plate	Jersey ...	12 July ,,	530	4·6	27 43	
Lilia	Ayrshire ...	3 April ,,	620	3·9	26·98	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	436	5·1	26·68	
College Evening Glow	,, ...	10 Nov. ,,	352	6·2	26·18	
Rosine	Ayrshire ...	19 Jan., 1921	603	3·6	24·09	
Miss Fearless ...	,, ...	21 May ,,	637	3·4	25·08	
Hedges Dutchmaid	Holstein ...	26 May ,,	660	3·3	24·06	
Leda's Jessie ...	Jersey ...	14 Jan. ,,	289	6·8	23·55	
Thornton Fairetta	,, ...	15 Mar. ,,	348	5·6	23·38	
Confidante ...	Ayrshire ...	12 May ,,	481	4·1	22 27	
Royal Mistress ...	,, ...	19 Mar. ,,	570	3·5	22·12	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	351	5·3	21·65	
Confidence... ...	Ayrshire ...	8 Feb., 1921	513	3·8	21·62	
Comedienne ...	Jersey ...	26 Nov., 1920	425	4·4	20·98	
College Cobalt ...	,, ...	6 Jan., 1921	411	4·5	20·73	
College Grandeur	,, ...	29 Dec., 1920	403	4·6	20·72	
Gatton Empire Lass	Guernsey ...	3 May, 1921	427	4·2	20·12	

NOTE.—Only cows producing 20 lb. of butter, or over, for the month are included in this list. The rainfall at the College for the month of July totalled 412 points.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JULY, 1921.

In spite of the unseasonable weather conditions, the production for the month was satisfactory. There were odd cases of moulting, but very little trouble was caused by broodiness, and the health of the birds generally has been good. R. Gill's group of White Leghorns made top score for the month in the light section with 141 eggs. In the heavy breeds W. Becker's group pen of Langshans laid the largest number of eggs with 151 to their credit. The groups generally have been more settled during the month. This can, in a great measure, be attributed to the shelter caused by the continuous housing, the backs being solid for a distance of 120 feet. A plentiful supply of green feed has been available. The following are the individual records:—

Competitors.	Breed.	July.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	141	490
H. C. Thomas	Do.	129	476
F. Birchall	Do.	122	465
*W. and G. W. Hindes	Do.	133	460
*J. M. Manson	Do.	139	454
*G. Trapp	Do.	100	447
Oakleigh Poultry Farm	Do.	132	445
*Mrs. R. Hodge	Do.	127	429
*C. M. Pickering	Do.	121	427
*H. Fraser	Do.	116	425
R. C. Cole	Do.	127	422
*J. W. Newton	Do.	122	418
*H. C. Towers	Do.	113	416
W. A. Wilson	Do.	107	401
*T. Fanning	Do.	119	380
*W. Becker	Do.	112	374
*Chris. Goos	Do.	117	372
*E. Chester	Do.	121	372
Bathurst Poultry Farm	Do.	111	369
W. Barron	Do.	113	366
*R. C. J. Turner	Do.	110	363
H. Stacey	Do.	131	360
O. C. Goos	Do.	81	359
Mrs. E. White	Do.	106	359
M. F. Newberry	Do.	113	355

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	July.	Total.
LIGHT BREEDS—*continued.*			
E. Stephenson	White Leghorns... ...	112	355
Mrs. E. Z. Cuteliffe	Do.	120	351
*Thos. Taylor	Do.	117	350
J. W. Short	Do.	94	347
*Thos. Eyre	Do.	123	345
*B. Chester	Do.	121	334
*Mrs. L. Anderson	Do.	111	334
*S. L. Grenier	Do.	104	329
*S. Williams	Do.	109	325
*Haden Poultry Farm	Do.	100	322
*W. and G. W. Hindes	Brown Leghorns... ...	103	312
*E. A. Smith	White Leghorns ...	86	311
Linquenda Poultry Farm	Do.	108	303
W. M. Glover	Do.	110	288
*H. P. Clarke	Do.	115	277
Brampton Poultry Farm	Do.	95	257
HEAVY BREEDS.			
Jas. Potter	Black Orpingtons ...	117	523
T. Fanning	Do.	132	509
*J. Ferguson	Chinese Langshans ...	134	465
*T. Hindley	Black Orpingtons ...	124	459
Rev. A. McAllister	Do.	133	454
*A. E. Walters	Do.	131	442
Jas. Every	Langshans	120	440
Jas. Ryan	Rhode Island Reds ...	139	436
G. Muir	Black Orpingtons ..	127	426
*R. Burns	Do.	147	424
*C. C. Dennis	Do.	141	412
*Parisian Poultry Farm	Do.	146	409
W. Becker	Langshans	151	403
*E. F. Dennis	Black Orpingtons ...	134	395
*R. Holmes	Do.	129	393
*E. Stephenson	Do.	107	375
*E. Morris	Do.	135	372
*J. Cornwell	Do.	129	368
G. Cumming	Do.	122	348
*H. Chaille	Do.	105	335
*Mrs. G. Kettle	Do.	110	310
J. W. Newton	Do.	114	297
*N. A. Singer	Do.	132	293
*A. Shanks	Do.	120	292
*J. E. Smith	Do.	140	284
*E. Oakes	Do.	102	235
F. H. Harrington	Do.	121	211
T. C. Hart	Do.	93	185
Total	...	8,226	25,839

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
W. and G. W. Hindes	88	64	78	90	86	54	460
J. M. Manson	68	83	83	68	85	67	454
Geo. Trapp	73	68	72	73	79	82	447
Mrs. R. Hodge	66	84	81	73	83	42	429
C. M. Pickering	81	74	64	62	85	61	427
H. Fraser	80	65	75	61	76	68	425
J. W. Newton	72	81	78	59	72	56	418
H. C. Towers	77	59	72	50	72	86	416
T. Fanning	73	59	64	61	55	68	380
W. Becker	71	79	52	57	92	23	374
Chris. Goos	67	83	28	40	52	102	372
E. Chester	63	68	61	61	58	61	372
R. C. J. Turner	67	57	54	48	67	70	363
Thos. Taylor	52	69	58	39	50	82	350
Thos. Eyre	52	54	46	59	69	65	345
B. Chester	49	49	74	50	70	42	354
Mrs. L. Anderson	47	65	60	59	63	40	334
S. L. Grenier	57	77	32	59	56	48	329
G. Williams	91	61	32	43	48	50	325
Haden Poultry Farm	52	44	50	56	52	68	322
W. and G. W. Hindes	42	38	33	74	50	75	312
E. A. Smith	80	53	53	48	45	32	311
H. P. Clarke	79	36	46	26	42	48	277
HEAVY BREEDS.							
J. Ferguson	83	67	66	86	80	83	465
T. Hindley	95	72	77	66	79	70	459
A. E. Walters	76	82	68	78	61	77	442
R. Burns	34	57	99	50	91	93	424
C. C. Dennis	80	67	50	76	69	70	412
Parisian Poultry Farm	66	66	66	95	38	78	409
E. F. Dennis	46	75	62	64	63	85	395
R. Holmes	56	57	62	74	91	53	393
E. Stephenson	72	59	65	59	51	69	375
E. Morris	57	73	32	83	62	65	372
J. Cornwell	61	38	66	75	65	63	368
H. Chaille	38	68	54	81	66	28	335
Mrs. G. Kettle	49	68	77	25	33	58	310
N. A. Singer	47	37	49	52	38	70	293
A. Shanks	22	51	39	57	62	61	292
J. E. Smith	78	76	51	38	25	16	284
E. Oakes	8	59	42	65	37	24	235

CUTHBERT POTTS,
Principal.

The Orchard.

NOTES ON THE MANURING OF PINEAPPLES.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In spite of the advice that has been given by the Agricultural Department for many years respecting the manuring of pineapples, many growers still fail to realise that the pineapple plant requires special manurial treatment which will provide an ample supply of the essential plant foods in a form that will enable it to utilise them to the best advantage.

Experience has taught us that the success of pineapple culture does not depend so much on the richness of the soil as on its being in a good mechanical condition and possessing good natural drainage. Such a soil is naturally warm, and if the situation is suitable is not likely to be subject to frost. The good mechanical condition of the soil encourages root formation, and if the soil has been well prepared, deep rooting; so that the feeding roots of the plant have a much larger area from which to obtain their supply of food than is the case when the majority of their feeding roots are near the surface.

Such a soil responds readily to the application of manure; consequently it is of the greatest importance to make sure that the manures applied to develop the pineapple crop are applied in the right form and that they contain their plant foods in the proper proportions required by the plant. Manuring carried out on any other lines is simply a waste of money, as it is no use to apply a manure containing an excess of one plant food and a deficiency of others. A manure containing an excess of any particular plant food is not an economical one to use, especially where there is an excess of phosphoric acid, as the excess of this plant food cannot be made use of, and as a result it is either washed out of the soil by heavy rain or, unless there is an excess of lime present, it forms insoluble salts of iron and alumina which remain in the soil in an unavailable condition.

The great fault with the majority of commercial fertilisers with respect to their suitability as a manure for pineapples is that they contain a large excess of phosphoric acid that is not required by the plant and which is out of all proportion to the amount of its potash and nitrogen contents. As a result, such manures are bad buying on the part of growers as, on account of their badly balanced composition, they cannot be made use of by the pineapple plant to the best advantage, and the grower has thus paid for a quantity of plant food from which he will obtain no benefit.

Many commercial fertilisers, in addition to having a badly balanced ratio of plant foods as regards pineapples, also contain these plant foods in the wrong form.

The pineapple plant is very sensitive to any excess of acidity in the soil, and any such soils must have their acidity neutralised by the application of lime before they are fit to grow pineapples; consequently the addition of acid phosphates, such as are contained in a commercial fertiliser in the form of superphosphate, only tend to increase the acidity in the soil and render it less suitable for pineapple culture.

Commercial fertilisers containing superphosphate should therefore always be avoided as a manure for pineapples, and growers should be careful not to purchase any fertiliser in which the phosphoric acid is said to be water soluble on the tag attached to the bag or on the invoice. Phosphoric acid should be in the citrate soluble form, such as occurs in bones, meatworks manure, finely ground island phosphates rich in carbonate of lime, basic slag, or basic superphosphate, or it can be present in a less soluble form which will become slowly available. Growers should therefore see that the phosphoric acid as stated on the tag or invoice is citrate soluble or insoluble, the larger proportion being citrate soluble.

The potash contained in the fertiliser should be in the form of sulphate, if procurable, as experience has shown that in this form its use has proved very beneficial; at the same time, the use of the muriate or chloride has so far shown no ill-effects.

The nitrogen contained in dried blood, bone dust, or meatworks manure has given very good results, and when procurable dried blood is probably the best form in which to apply this plant food. The price is, however, very high, and sulphate of ammonia has, therefore, taken its place in the majority of complete commercial

Photo. Dept. Agriculture and Stock.]

PLATE 31.—PINEAPPLE MANURING AT BEERBURRUM SOLDIER SETTLEMENT.

1. Effects of badly balanced manure.
2. Effects of well balanced manure.
3. A 4-year old plantation revived by well balanced manure.
4. A closer view of No. 3.

fertilisers, and, when used in the right proportion, has given good results. Nitrate of soda is also a good form in which to apply nitrogen, but from my experience it is better to apply this manure as a top dressing by itself rather than to use it as a component part of a complete fertiliser. The growing of a green crop for the purpose of providing a supply of nitrogen must be watched very carefully, as there is always the danger of rendering the soil acid by turning in large quantities of green material which generates acidity during the process of decomposition. Should this take place, the addition of lime to the soil will soon correct the acidity.

Many manurial experiments were carried out by the Department some years ago on pineapples growing on different classes of soils in the Brisbane District, and the result of those experiments is contained in the advice I have just given and the correctness of which has again been proved by a number of manurial experiments that have been carried out at Beerburrum, both on the State farm and on soldiers' holdings, where it has been shown conclusively that the majority of commercial fertilisers contain far too great a proportion of phosphoric acid in comparison with their potash and nitrogen contents, and, further, that the application of phosphoric acid in the form of superphosphates or water soluble phosphoric acid is distinctly injurious to the pineapple plant and is the cause of "spiking," viz., the production of narrow leaves indicating the weakened vitality of the plant.

A complete manure in use at Beerburrum, which has given very good results, contains approximately 4 per cent. of phosphoric acid, citrate soluble, 14 per cent. of potash in the form of sulphate, and 7½ per cent. of nitrogen in the form of dried blood, and this mixture is applied at the rate of 750 lb. to the acre during the months of August, September, and February. If these figures are compared with those of any complete commercial fertiliser on the market, it will be seen how small an amount of phosphoric acid is used as compared with that contained in the commercial article, and what a large amount of nitrogen and potash is present. This shows conclusively that growers are wasting money by applying an excess of phosphoric acid to their pineapple crops, and that the money so spent would have been much more profitably invested in the purchase of the nitrogen and potash that their crops needed.

The results obtained at Beerburrum bear out, as already mentioned, those obtained by this Department some years ago; and, further, they are in accord with the requirements of the pineapple plant and fruit as shown by chemcial analyses. A careful perusal of these analyses discloses the fact that the pineapple plant and fruit require twice as much nitrogen and more than twice as much potash as they do of phosphoric acid.

Growers will therefore see that it will pay them to apply the right manure to their pineapple crop, and that they only waste money by purchasing manures containing an excess of a plant food which this crop is unable to make use of.

HAND-REARING OF CALVES.

Hand rearing is adopted by most dairymen in order to procure the best monetary returns, but frequently the calf is the sufferer. A young animal requires natural food for the first few months; consequently, it cannot be expected to thrive and and keep in good health when it is fed on separated milk, practically devoid of fat, and frequently more or less contaminated with dirt and its accompanying organisms.

It is most important, for the first two or three days after birth, to give the calf its mother's milk (colostrum). This acts as a natural laxative, which is essential to clear the bowels of fœtal deposits (meconium). Following the first few days the calf should be given about 2 pints of new milk three or four times daily for at least four weeks, after which skim or separated milk can be given which is mixed with other foods, such as oatmeal or linseed gruel, the latter making up for the abstracted fat. Usually, when the calf is six weeks old it begins to pick grass or a little hay, but the skim milk and linseed should be continued until the calf is three or four months old, and always given at about the normal blood heat.

LINSEED JELLY.

Boil slowly for three or four hours, 1 lb. of linseed in 3 quarts of water, so that about 2 quarts of jelly or thick fluid remains. Mix about 4 oz. with the separated milk at each meal. Increase quantity as required.

OATMEAL GRUEL.

Mix 1 lb. of oatmeal in a gallon of cold water, and then boil; keep well stirred, then allow to simmer over a slow fire until it becomes thick. Allow 4 to 6 oz. with separated milk at each meal.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

SPATHODEA CAMPANULATA.

(Tropical West African Tulip Tree.)

NATURAL ORDER.—BIGNONIACEÆ.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(From "Botanical Magazine," T. 5091, and "Flora Tropical Africa," vol. 4, page 529.) This very beautiful flowering tree was first found and described by M. de Beauvois, a noted French botanist, who collected specimens at Oware, West Africa. It is common in many localities of Upper, South, Central, and Lower Guinea, such as Sierra Leone, Nigeria, Cameroons, French Congo, Lower Congo, Congo Free State, and many others.

Description.—A tree 20 to 50 ft. high, of erect habit, with freely branching top. Leaves opposite, from 12 to 18 in. long, swollen at base, pinnate, dark green, paler and somewhat silky beneath, particularly in young state, leaflets from 4 to 8 pairs, and single terminal one, ovate lanceolate, acute, quite entire, and penninerved.

Flowers, in short dense terminal racemes, corymbose, large, spreading, consisting of from 8 to 10 rather long and stout-pedicelled, very large showy flowers. Calyx like a spathe, 2½ in. long, splitting open on one side for the emission of the corolla. The corolla is about 4 in. long and the same in breadth, of a rich orange red colour, slightly paler within the tube; in form, broadly campanulate (bell shaped), yet curved upwards, the tube being suddenly contracted at the very base, where it is attached to the calyx. This gives the individual flowers a somewhat lop-sided appearance, sharply contrasting with the even form of the tulip, from which it takes its vernacular name. The tube is from 2 to 2½ in. in depth, stamens four included within the tube, spreading, one pair being a little taller than the other two. Anthers of two divergent, linear, oblong, dark brown linear cells opening longitudinally, ovary ovate.

Seed Capsule lanceolate oblong, from 6 to 10 in. long; valves keeled, seeds flat, about 1 in. in length and ½ in. broad. This includes the white hyaline wing that surrounds the dark brown seed, in appearance resembling very much that of *Jacaranda mimosæfolia,* the well-known Brazilian tree of the same natural order. A capsule that ripened in the Botanic Gardens contained a little over 1,000 seeds, but only about one-quarter were fertile.

Spathodea campanulata flowers from April until June, but spasmodic racemes of flowers are often borne out of the usual flowering season. A good specimen, near the George street entrance of the Gardens, when in flower always attracts the attention of visitors. There are three other flowering specimens in the Gardens, and a line of these beautiful trees, alternating with *Poinciana regia,* was planted last year along the river bank from the Domain to end of old line of bunya trees.

Propagation.—By seed. As the trees in the Botanic Gardens are now commencing to seed, this fine tree will soon be more often seen, and its brilliant orange-red flowers will enliven the landscape at rather a dull time of year. It would make an excellent street tree, but for the large flowers falling on hard pavements being likely to prove slippery and dangerous to pedestrians; still, as they are such striking and attractive flowers, passers-by would probably pick them up.

HORTICULTURAL NOTES.

This is a very good time to plant out palms, the cold weather being over, and they will have a chance of getting a hold of the ground before the heat of summer is in evidence. When planting, don't disturb the roots unduly; they are very averse to such treatment. Should the roots be in a dense mat, remember palms send out new roots from the stem that take up the running when the earlier root system of the plants has completed its work. Kinds to plant in warm localities.—*Phœnix rupicola* is a very beautiful palm for lawn specimens, as it does not grow too tall;

From coloured plate, "Botanical Magazine."

PLATE 32.—TULIP TREE (*Spathodea campanulata*).

Oreodoxa regia (Royal Palm), and *Cocos plumosa* (Feather Palm). Of the latter a good type should be planted. Those of not too tall a nature should be used, and *Livistona chinensis* (Chinese Fan Palm) is also very ornamental. For cool districts the "Cotton" Palm (*Washingtonia filifera*) is very suitable, as it stands a fair amount of cold; also Cocos Yatay, the Brazilian Wine Palm.

Pot plants and bush-houses should now receive attention. Look over the former, and re-pot all needing attention, particularly ferns and palms. Don't overpot. Soil in pots not used or penetrated by roots is very apt to go sour. Wash clean all old pots, and soak new ones in water before using. Use a free compost of about equal parts of leaf mould, good loam, sharp sand, and old well-decayed cow manure. A little charcoal mixed through the compost is advantageous, particularly for ferns, gloxinias, and caladiums. For the two latter, both the manure and sand portions of the compost should be increased. When repotting, provide for good drainage; this is most important, and keep the plants well supplied with water afterwards.

In the flower garden, keep young aster plants growing freely. Remember that if they once get a severe check in growth, large plants and first-class flowers cannot be looked for. Plant our chrysanthemums. Old clumps are best brokn up. Select a nice strong portion, plant in a fresh place if possible, and throw out the remainder if not required. If not replanted, chrysanthemums degenerate quickly, and only sunflowers, and portulaca seeds. This latter is a useful, bright flowering plant, and may be grown during the summer on newly-planted rose beds to act as a protection of the surface from the hot sun of summer. Keep all newly-planted things watered, and stir the surface soil occasionally.

AN EASY WAY OF STARTING OIL ENGINES.

To every user of engines driven by crude oil the process of starting is a nightmare. The blow lamp, by means of which the fuel spray is usually given its initial heat, is a device with an almost satanic cussedness of behaviour. Moreover, its use involves a considerable amount of time as well as trouble. Consequently, there ought to be a wide welcome for an ingenious electric heater developed by a leading British firm of oil-engine makers. The device is extremely simple. It consists essentially of an electric heating element of high resistance wire placed in the line of action of the oil spray. A small amount of current suffices to make this wire white hot, in which condition it brings the spray rapidly to the temperature required for starting. After the engine has gone ahead the element is withdrawn, so that it is not exposed for more than a minute or so to the high temperature of the combustion chamber, an arrangement which gives it long life and great reliability. The electric current required for operating the heater is supplied by a 4-volt or a 6-volt battery charged from a tiny electric generator, driven through a bolt from the engine. By means of this device the engine can be quickly started up from the cold without the slightest trouble. Twelve months' trial of the apparatus has shown it to be thoroughly satisfactory.

HAND-REARING OF FOALS.

There is a great deal of trouble in hand rearing a foal. As is well known, the first milk any animal gives after parturition is known as "colostrum," which is a natural purgative. Consequently, it is necessary, if a foal is hand fed from the time of its birth, something must be given as a substitute for this colostrum. The best milk for this purpose is that from a newly calved cow or heifer—a few days after calving. The milk of the one animal only should be used.

If the foal has not had the colostrum from its mother and appears constipated, give a small dose of castor oil—about two tablespoonfuls—and enemas of glycerine and water.

The chief difference between a mare's milk and cows' milk is that the latter has a larger proportion of casein and fat, and a deficiency of sugar; therefore, one must add sugar when cow's milk is used. At first give 1 part of water to 2 parts milk (half a pint every half-hour). A few weeks later give 1 part of water to 3 parts milk. When about two or three months old, give pure milk. Gradually increase the time between the meals as the foal gets older.

Milk should be given at the natural temperature, great cleanliness being observed in handling and diluting the milk.

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"In the course of the month the districts of Maryborough, Pialba, Yerra, Mount Bauple, and Nambour have been visited. An inspection was also made of districts between Gympie and Nambour.

"*Maryborough.*—The Maryborough district is at present in a promising condition in respect to sugar-cane culture. The areas planted are not extensive, but the cane is well grown, and at present the sugar content is fairly high. Farming operations are being impeded by the water that is on the ground. Preparations for spring planting are being pushed on, several farmers being engaged in the clearing and tillage of hitherto uncultivated soils.

"Not sufficient trouble is being caused by cane pests and noxious weed growth for comment, although gumming is evident in places. An inspection of the various canes showed that D.1135, 1900 seedling, and M.87 are probably doing better than any. There are no new features to comment upon.

"The soil needs lime and green manures. More care requires to be taken in selection of plants, and farmers should make the question of cultivating their young plant cane a more serious one, and not use heavy implements in the early processes.

"There are at present some good crops in the Pialba District. The heavy rain has given the soil a thorough soaking, and this, combined with economical bursts of warm sunshine, has caused the cane to make strong growth. Some of the plant standover cane ought to go 40 tons per acre, and the great bulk of the crop should average between 20 and 30 at the time of cutting. This does not include, however, cane practically killed by the drought. There is a small acreage in the latter condition that ought to be ploughed out as soon as the useful cane has been cut from it. So far, the growers have escaped frosts, but there is a likelihood that these may occur at any time, as the nights are fairly cold. Nothing serious in respect to insect or bacterial attack could be detected in the fields, and if farmers watch their planting operations carefully, the coming season should produce a fine crop of healthy cane. As previously mentioned, these lands want lime and green manures. Regarding varieties, D.1135 and 1900 Seedling are both making a fair showing. The former is the staple variety at Pialba. Such canes, however, as Q.813, E.K.1, E.K.28, and 100 Bont, all recently distributed from the Experiment Station, are making good growth, and are well worth looking after. Shahjahanpar No. 10 is also a cane lately brought from Bundaberg, and has struck fairly vigorously. It has a reputation as a frost resister and is worth watching. Satisfactory conditions prevail at Yerra. Most of the cane is vogorous, showing little signs of disease. Clearing of virgin land is in progress. Bad roads are still the greatest drawback. Farmers here, as well as in other districts, should remember that in the early months of the cane's growth it is absolutely essential to check weed growth and keep a good tilth on the soil. By careful observation of these principles they will increase their output very considerably. Weeds are greedy feeders, and rob the cane of much in this respect..

"*Mount Bauple.*—The growers at Mount Bauple are going to have a fairly good yield this crushing. In common with other areas, the good rains have pushed the crops ahead and given the ground a thorough soaking. Some of the plant standover crop looks especially well. Insect pests are well under control, with the exception of a borer attack in isolated patches.

"Some remarkably good crops are being produced at Bauple on the forest loams. These soils (*i.e.*, forest loams) have no great powers to sustain crop after crop, but they are prolific for a few years and then require green manure. The growers in this district, as a general rule, recognise the value of good tillage, and many are working and carrying on efficient ploughing and cultivating under very adverse conditions, particularly where the country is hilly.

"On the road between Gundiah and Bauple there is a considerable amount of cane growing in a healthy condition, and one farmer, Mr. Woods, in common with several others in this locality, will have some very good cane to cut.

"*Cooroy.*—An inspection was made of the land around Cooroy. Some farmers there have planted cane (variety D.1135 and H.Q.285) which looks well. These men ought to persevere, as conditions are suitable and they now have enough cane for plants. Cooroy is not ideal for canegrowing, but much of the land would grow this crop.

"*Yandina.*—While at Yandina a visit was made to Mr. Bowder's property. This gentleman has done some excellent development work in this locality, and has been repaid by a good crop. On a previous visit to this farm, nothing like the present crop was anticipated, and in some places it will go 35 and 40 tons per acre. The three varieties planted, D.1135, H.Q.285, and Q.813, all look well. A siding has been constructed at the instance of Mr. Bowder near the holding.

"*Nambour.*—Nambour district looks well at the present time. An inspection was made while here of the Maroochy River and Coolum areas. At the latter place several energetic men are busy draining big areas that are virtually swamp, but nevertheless very rich land. If the water is successfully taken off—and there is no reason why it should not be—then some big crops of cane should result. That cane will grow on the drier lands has been demonstrated also. Mr. White, a farmer in this locality, has a very fine plant crop of D.1135. There are also several other growers who have good plant crops to their credit.

"As yet, at least as far as the swamp is concerned, the matter hinges on the success of the farm engineering problems. Bigger and straighter drains than are at present in existence are necessary, thus reducing friction and increasing velocity, and the diverting of water that comes from other sources on to these areas is also essential. Coolum is a delightful place, admirably suited for banana and citrus fruit growing, and closer settlement generally.

"*Maroochy.*—The Maroochy River is going to yield some extra heavy crops of cane this year. Varieties such as N.G.16, H.Q.285, D.1135, and Malabar are all cropping heavily, especially the latter. One crop of this cane on Mr. Fahey's place will go close to 100 tons per acre. The average yield on the river this year ought to be from 35 to 40 tons per acre. A feature noted during the inspection was the absence of disease, although in places, on N.G.16, a fungoid parasite, indicated by a red rusty spot, is attacking the leaf. If this spreads, growers would do well to give this variety a rest. They can do so without hardship, as there are several other good growing canes to choose from.

"One or two old patches of cane here should be ploughed out. There is also an inclination to ratoon too often. Green manures as well as lime would increase the yield on some of the poorer soils. Practically all the farms inspected on these areas would benefit by the use of lime. Abnormal rains have fallen on the Maroochy River this year."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from Mr. E. H. Osborn, Northern Field Assistant:—

"*Bowen.*—A visit of inspection was paid to the Bowen area in the middle of July, and it was noticed that, considering the dry weather that had so lately been experienced, the crops were looking very well. The irrigated blocks, despite the dry weather, were looking fair, but where watering had been carried out some splendid cane may be seen.

"The rainfall to the end of June was 24.69 inches, and early in the following month a further 2.71 inches were registered. Before the latter fall the cane had started to go off considerably, but this welcome downpour freshened everything up. The principal varieties grown are the Gorus, N.G.24, 24B, Badila, D.1135, and H.Q.426 (Clark's Seedling). The two former canes are doing remarkably well, especially where irrigated, and some very heavy tonnages per acre will be harvested. D.1135 also looks well, but H.Q.426 did not appear to be doing so well where noticed. Not very much Badila was seen. As evidence of the remarkable fertility of the land at Mr. J. Maltby's farm, the following crops were growing:—Cane (looking splendid), maize, Indian corn, sorghum, buckwheat, oats, tares, lucerne, English and sweet potatoes, pumpkins, onions, eschalots, turnips, mangels, parsnips, horse radish, cabbage, cucumbers, beans, peas, rhubarb, egg fruit, strawberries, citrus fruits, and tomatoes. This shows what can be done by an up-to-date farmer aided by irrigation.

"The soil generally is stiff or sandy deep black and brown loam, and can certainly grow good crops of high density cane. Most of the farmers seen expressed

their intention of increasing their present cane areas, as they find that the Proserpine Mill is ready to take any cane that they can supply. Green manuring or liming has not so far been extensively gone in for, but is, I think, likely to become more popular, as a number of farmers expressed their views to that effect.

"*Proserpine.*—Proserpine was next visited. At this sugar centre the conditions were found to be quite the opposite to those ruling at Bowen, as up to the time of writing 81.88 inches of rain represented the rainfall from 1st January. This large rainfall has had the effect of seriously retarding all ploughing and planting operations.

"A very large acreage of ground had been ploughed several times, but planting, except in a few favoured parts, had not been possible. This was most noticeable on the Albert and Kelsey Creek land, planting there being in full swing whilst other less fortunate areas were idle.

"Now that the mill management has provided an extra length of portable line for the growers at this end, a larger area of the rich deep soil here is being planted for next season. There is still, however, a further area of really good land that ought to be growing cane. The general appearance of the crops in the vicinity of Albert and Kelsey Creeks is most promising. Some fine crops of 24B, H.Q.426, Badila, Q.813, 1900 Seedling, and D.1135 were noticed.

"Taking the Proserpine District as a whole, however, it is unlikely that the earlier estimates of tonnage to be crushed will be realised, as the constant wet and very little warmth has not been conducive to a good growth.

"The cane was also considerably knocked about by wind a couple of weeks ago, H.Q.426 suffering most severely from this cause.

"Among the varieties of cane grown locally, H.Q.426, Malagache, Green and Red Goru (24B and 24), Badila, Striped Singapore, D.1135, 1900 Seedling, and Q.813 were noticed. The latter cane has evidently come to stay, and seems to suit the district well. All the farmers here taken a keen interest in any new varieties, and their association is getting a large number of plants from the Mackay Experiment Station next month. The varieties asked for include Q.970 and Q.1121, among others. On various parts of the area some fine crops of 24B were noticed growing; 1900 Seedling was also looking well.

"This district has so far been fairly immune from pests, only light traces of grubs being noticed throughout the cane areas. In connection with grubs, it will be remembered that Mr. R. Redhead, of Strathdickie, suffered severely from them. He then planted corn, but this was also attacked by the pest.

"Subsequently, last year he again planted with cane (H.Q.426), using 80 lb. of 90 per cent. arsenic to the acre in the drills with the plants. This cane is now a fairly mature crop, looking beautifully green and healthy, without any sign of grubs.

"Borers were noticed in several parts of the district, H.Q.426 seeming to attract them more than any other variety. Too much care cannot be taken in using healthy plants in connection with this pest.

"Very little liming or green manuring has been carried out in this locality; the cost of the former has, to some extent, been the reason. With more liming and draining, better crops should certainly be grown.

"When the large area of idle land adjacent to the mill's tramlines is noticed, it raises the hope that the drainage scheme now spoken of will very soon be put into effect. This would enable some hundreds of acres of good quality land to be put under cultivation.

"The mill started crushing operations on the 28th ultimo."

SHAHJAHANPUR, No. 10.

A few years ago a variety of sugar-cane called Shahjahanpur, No. 10, was received by the Bureau of Sugar Experiment Stations from the Shahjahanpur Sugar Experiment Station, India, being recommended as a cane which would stand cold weather well. This cane was planted out at the Bundaberg station, where it was found to resist severe frosts remarkably well. Its sugar content and cropping qualities being good, it was ultimately distributed to a considerable extent in Southern Queensland. On a recent visit to Bundaberg, Mr. Easterby stated that his attention had been directed to a very fine block of this variety, about 12 acres in extent, which had been grown at Spring Hill by the Fairymead Sugar Company, under the charge of Mr. Axam. This cane was then only nine months old, but presented a splendid vigorous growth. Mr. Axam said that in his experience with the cane it had never been affected by frost, and this was borne out by Mr. Pringle, the chemist in charge of the Bundaberg Sugar Experiment Station. If this cane maintains its reputation, it should be extremely valuable to canegrowers who suffer

from frost. The last analysis of the cane made at the Bundaberg Station last year gave the following results:—

Brix	21.7	per cent.
Purity of juice	91.0	per cent.
Fibre in cane	13.6	per cent.
Commercial cane sugar	15.05	per cent.

The Fairymead Sugar Company have been of great assistance to the work of the Sugar Bureau in demonstrating this variety, and also Q.813, on large blocks of land.

BANANA POCKET AND THOMSON CREEK LANDS, NEAR PROSERPINE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 5th August, 1921) from the Northern Field Assistant, Mr. E. H. Osborn, on the above lands and their suitability for cane-growing:—

"In accordance with your instructions, I beg to report that in company with Mr. E. G. Lascelles, I inspected the following areas:—Banana Pocket is situated 14 miles south from Proserpine, and about 5½ miles east from the proposed Thomson's Creek railway siding, on the Mackay extension of the Government line, and over fairly level country.

"The 'Pocket' lies between Thomson Creek and the O'Connell River (both tidal waters), which empty themselves into Repulse Bay. There are some 2,000 acres of freehold land there, of which about 1,500 acres, consisting of, say, 750 acres of scrub and 750 acres of forest, are very good. Adjoining this area is a Crown lands reserve of 555 acres, of which about 400 acres should be suitable for growing cane.

"There is also an additional area of fully 500 or 600 acres of Crown lands, but situated upon the northern side of the O'Connell River.

"In and about the Pocket the soil consists of a rich deep black porous alluvial loam, from 2 feet in depth and upwards, with an underneath soil of some 10 to 14 feet in depth of porous river silt. Underneath this again is water-worn small boulders or sand. In the scrub the soil is similar but lighter in colour. The forest country carries such timber as acacia, apple, Moreton Bay ash, and gums. The scrub, which is fairly thick, carries the usual scrub timbers and lawyer cane.

"On the freehold area twenty-nine farms have been cut up, each of them having about an equal amount of scrub and forest land. About nine families are now occupying farms, growing bananas, corn, sweet and English potatoes, and tobacco. Nearly all of them have small plots of cane, grown principally for pig feed, but also to show that cane can be grown here successfully. I am told that plenty of well water can be obtained at a depth of about 18 feet. The nearest rainfall figures that can be obtained are those from the Goorganga Homestead. The average rainfall from 1914 to 1920—not including 1916, of which the record has been lost—was 58 inches per annum. So far the fall for this year is 58 inches as against 81.68 inches to date at Proserpine.

"Flood waters get away very quickly and do very little damage, and owing to the porous nature of the soil very little water is left lying about. Frosts also are very slight; bananas continually growing on one block for five or six years bear this out.

"Upon the farms visited some splendid cane was noticed growing. It was all planted in October and November of last year, and included such varieties as H.Q.426 (Clarke's Seedling), Goru 24A and 24B, Striped Singapore, D.1135, Malagache, Badila, and 1900 Seedling. Taking into consideration the time of planting, all the cane looked well, the 24B, Badila, and 1900 Seedling particularly so. Some of the 1900 is very fine and growing true to type. In one place a stool of thirteen or fourteen months' old Badila gave from two plants over thirty thick and vigorous canes, with an average length of about 6 feet.

"None of the cane has had much attention paid to its cultivation, and one cannot but fail to be struck with its extremely healthy appearance and splendid growth. Upon another farm some stools of green Goru (24B) said to be fourth or fifth ratoons are now carrying sticks of 5 or 6 feet in length. I am told that this particular lot has practically grown wild, being eaten down several times by cattle and other animals, but still persists in growing, and gives a fair idea of the value of the soil.

"The farmers now settled here are living in the hope that the splendid cane-growing possibilities of this rich area will be recognised in the near future, as they are certain that if the country is once opened up by either tramway or railway communication, there would be no shortage of cane for the Proserpine Mill."

PLATE 33.—BANANA POCKET—BANANA FARM.

Photo by W. Purcell.

PLATE 34.—BANANA POCKET—CROP OF MAIZE.

Photo by W. Perroux.]

PLATE 33.—BANANA POCKET—CROP OF TOBACCO.

Photo. by H. Pengelly.

PLATE 36.—BANANA POCKET,—CROP OF TOBACCO.

Photo. by W. Perroux.

PLATE 37.—BANANA POCKET—TOBACCO-DRYING SHED.

[Photo: by W. Perroux.]

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 23.

SNAKE WEED (*Stachytarpheta dichotoma*).

Description.—An erect branching herb, 2 to 3 feet high. Stem and leaves smooth, not hairy. Leaves elliptical or somewhat obovate, gradually tapering at the base into a distinct leaf-stalk, 1 to 3 inches long, ½ to 1 inch broad, the margins toothed. Flowers in long terminal slender spikes of up to 15 inches in length. Individual flowers bright blue, about ½ inch across, the lower part more or less sunk in a depression in the rhachis of the spike. Fruit (''seeds'') enclosed in the calyx, consisting of two dark-brown narrow nutlets, 2 to 2½ inches long.

Distribution.—A native of tropical America now widely distributed as a naturalised alien in most tropical and subtropical countries. In Queensland it occurs practically along the whole of the coastal belt.

Common Names.—It is very abundant about Cooktown, and Mr. Pollock informs me that it is known there as ''Snake Weed'' in allusion to the long narrow spikes of flowers. J. C. Loudon in his ''Encyclopædia of Plants'' gives ''Bastard Vervain'' as a common English name.

Botanical Name.—Stachytarpheta, from the Greek *stachys,* an ear of corn, and *tarphetos,* thick, alluding to the flowers being closely packed in a long slender spike; *dichotoma* from the Greek *dichotomeo,* I cut in two, in allusion to the branches coming off in opposite pairs.

Properties.—No uses seem recorded for the plant. It is not known to be poisonous in any way, but seems to be left quite untouched by stock.

Eradication.—In small areas hand pulling or hoe cutting is the most effective method. In larger areas, where the plants are growing thickly together, spraying with a weed-killing solution should be successful.

Botanical Reference.—Stachytarpheta dichotoma, Vahl. Encyl. 1. p. 207 No. 5.

TWO PLANTS POISONOUS TO STOCK.

By C. T. WHITE, F.L.S., Government Botanist.

Writing from Malanda, North Queensland, Mr. H. Jubt writes, under date 18th July, 1921, ''Please let me know the name of the bush of which I enclose a leaf of two. I might state that I tied two valuable heifer calves to this bush and after they had nibbled the leaves, one died and the other went blind; it seemed to paralyse their hind quarters.''

The bush of which Mr. Jubt sent a specimen is the Finger Cherry (*Rhodomyrtus macrocarpa*), the fruit of which contains a sapo-toxin and is well known and dreaded in North Queensland as being capable of causing blindness in people who may eat too freely of it. This is the first notice, however, that has come under my notice of the plant being suspected of causing trouble amongst live stock by their browsing on the foliage, and it would seem that the poisonous principle was contained more or less in all parts of the plant. Referred to the Agricultural Chemist (Mr. J. C. Brünnich), that officer reported—''The presence of poisonous saponins in the fruit has been proved and there is bound to be some of this substance in the leaves where all these bodies are formed.''

Writing from Toowoomba to the Chief Inspector of Stock, the local inspector (Mr. R. O'Bryen) states, under date 28th July, 1921, ''I enclose samples of a weed received from Mr. George H. Anderson, of Kingsthorpe, who blames it as the cause of the death of a horse of his which had eaten of it.''

From coloured illustration in Curtis's "Botanical Magazine."]

PLATE 38.—SNAKE WEED (*Strachytarpeta dichoroma*).

The weed is the Henbit or Dead Nettle (*Lamium amplexicaule*), a common European and American weed naturalised in Australia but commoner in the southern States than in Queensland. It has been naturalised here for a number of years, but so far it has not asserted itself as a particularly aggressive species. Recent feeding experiments carried out in New South Wales and detailed by Dodd and Henry in the "Agricultural Gazette of New South Wales" for May, 1921, have shown the plant capable of producing staggers in stock. This is remarkable, as the weed is one that is common both in Europe and America and no cases are recorded against it in those countries.

It was also received last year from a farmer at Pratten (Mr. Chas. Baker) with the report that he suspected it of being poisonous. At that time, unfortunately, we knew nothing of the plant's bad qualities, and it is only within the last few months that its poisonous character has been proved.

Similar remarks apply to another very closely allied plant and a common weed in Queensland, viz., the Stagger Weed (*Stachys arvensis*). This weed in Australia is almost universally looked upon by stockowners as dangerous to working or travelling stock of any description, yet nothing of this character is heard about it in other parts of the world, though it is an abundant weed, practically speaking, over the whole of the temperate regions of the globe.

THE SASSAFRAS TREE.

Since the article that appeared in the July issue of the Journal dealing with the Yellow Sassafras (*Doryphora sassafras*) several settlers from the Atherton tableland have written stating that sassafras trees are common in the Northern scrubs, whereas the article in question states they do not occur north of Brisbane. The matter was referred to the Government Botanist, who states that the Northern sassafras trees, of which there are more than one kind, all belong to distinct species to the Southern one and that figured in the Journal, though the commonest belongs to the same family and is closely allied. The common Northern tree is *Daphanandra aromatica*, which differs from the *Doryphora* in leaves and floral structure.

POISONOUS "MILK WEED" (PRATIA ERECTA).

Mr. J. H. McCarthy, stock inspector, Beaudesert, reports:—

"A grazier on the Upper Albert River reported to me that he has been continually losing young sheep. I made a post-mortem examination of one for fly, stomach worms, and lung worms. Results negative. Stomach symptoms of poisoning were, however, strongly marked. An inspection of the farm, which is bare of grass, revealed the fact that the sheep were living almost entirely on 'milk weed' which, I have no doubt, caused the mortality in the flock. I have previously observed cases of this kind among young calves on a number of farms, death evidently being caused by eating milk weed. Young stock feeding over it for some days show no ill effects, but, later, symptoms of poisoning develop rapidly and death follows in about five or six hours. Pawing the ground and convulsions or 'fits' are marked symptoms."

A specimen of the weed forwarded by Mr. McCarthy was submitted to Mr. C. T. White, F.L.S., Government Botanist, who advises as follows:—

"The specimen sent is *Pratia erecta*, commonly known in many places as 'Milk Weed.' I have little doubt that the plant is poisonous, as reported by Inspector McCarthy, and I am much indebted to him for his remarks, which are interesting and worthy of being put on record."

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 6.

THE COONDOO (*Sideroxylon Richardi*).

Common Name.—The common name we have adopted is used in parts of the Wide Bay District and is applied to the tree because it is plentiful on Mount Coondoo. It is also known as "Sweet Bark" in allusion to its sweet astringent bark.

Derivation.—*Sideroxylon* from Greek *sideros*, iron; *xylon*, wood (alluding to the hard wood of some species); *Richardi*, after A. Richard.

Description.—A tree attaining 130 feet in height and a barrel diameter of about 3 feet. Barrel sometimes slightly flanged at the base. Bark brown, rather rough and somewhat scaly, shed in large irregular pieces; when cut, dark red and exuding a milky juice; measuring $\frac{3}{8}$ inch thick on a tree with a barrel diameter of 2 feet.

Young shoots and parts of the flowers covered with fine hairs. Branchlets fairly thick. Leaf stalks $\frac{3}{8}$ to 1 inch long. Leaves alternate, mostly crowded towards the ends of the branchlets, oval or elliptical, rounded, obtuse or occasionally drawn out into a point at the apex, especially in Northern specimens, midrib and sometimes the lateral nerves visible on the upper surface, but both are more prominent on the underside, where also numerous and fine net veins are often prominent; measurement of leaf blade, $2\frac{1}{2}$ to $5\frac{1}{2}$ inches long, twice to three times as long as broad. Flowers in clusters of 2 to 7 (seldom reduced to 1) in the forks of the leaves. Stalks of individual flowers $\frac{1}{6}$ to $\frac{1}{2}$ inch long. Each flower measures about $\frac{1}{6}$ inch long; the outer part, the calyx, consists of 5 broadly oval or nearly round lobes, which are sometimes finely hairy and measure about $\frac{1}{8}$ inch long; generally there are 3 outer lobes overlapping 2 inner ones. On the inside of the calyx is the corolla (the combined petals) which is broadly cylindrical or cup-shaped, measures about $\frac{1}{6}$ inch in length, and is divided to about the middle into 5 lobes. Stamens 5, included in the corolla, each stamen situated about or below the middle of each corolla lobe. Alternating with the stamens are 5 slender staminodia (undeveloped stamens). Ovary (in the centre of the flower) egg-shaped, often covered with very fine down, generally 5 or 4 celled, tapering into a hairless style about $\frac{1}{10}$ inch long. Fruit narrowly oval, black when ripe, surmounted by the short persistent style, about $\frac{3}{4}$ inch long, the outer fleshy part enclosing 1 or sometimes 2 seeds. Seeds narrowly oval, about $\frac{1}{2}$ inch long, the scar (hilum) narrow and more than half the length of the seed.

Distribution.—Scrubs of the coastal area of Queensland from the Tweed River in the South to the Barron River in the North. New South Wales, from Illawarra to the Tweed River. Confined to Australia.

Uses.—The timber should be useful for cabinet-making and general indoor work.

The late F. M. Bailey in his "Comprehensive Catalogue of Queensland Plants" quotes Dr. Jos. Lauterer to the effect that "The sweet astringent bark might be useful in throat diseases."

References.—*Sideroxylon Richardi*, F. von Mueller, in "Systematic Census of Australian Plants"; *Achras laurifolium*, F. v. Mueller, in Bentham's "Flora Australiensis," vol. IV., p. 282; *Sideroxylon laurifolium* (Rich.), Benth. and Hook. in Genera Plantarum IV., vol. 2, p. 665; F. M. Bailey in "Queensland Flora," part III., p. 955.

The name *laurifolium* had already been preoccupied in the genus for two extra-Australian species, and for this reason Mueller's name of *Sideroxylon Richardi* is adopted.

Photo. by W. D. Francis.]

PLATE 39.—THE COONDOO (*Sideroxylon laurifolium*), KIN KIN SCRUB.

Photo. Dept. Agriculture and Stock.]

PLATE 41.—THE COONDOO (*Sideroxylon laurifolium*): SHOWING LEAVES, FLOWERS, FRUIT, AND SEED.

Entomology.

BANANA BEETLE BORER* INVESTIGATIONS.

[FIRST PROGRESS REPORT.]

BY JOHN L. FROGGATT, B.Sc., Entomologist in Charge of Banana Beetle Borer Investigations.

INTRODUCTORY.

The literature on the subject of the Banana Beetle Borer is not extensive and, in so far as systematic research work is dealt with, it is scanty. There is, therefore, very little subject-matter available to guide the investigator in deciding what should be included and what excluded when devising a systematic scheme of work.

The first matter for study must necessarily be the development, habits, &c., of the beetle, in order to ascertain any period, or periods, in its life cycle during which it is more vulnerable to natural enemies, or more readily subject to treatment, than during the remainder of its life cycle. This entails a very careful and close study of the insect, both in the laboratory and in the field. As the necessary laboratory facilities are not yet available, a considerable portion of the investigations has been either impracticable, or, if not, beset with difficulties.

The following account of the field and laboratory investigations, carried out from 1st January to 30th June, 1921, cannot be looked upon as exhaustive on any portion of the subject, but is rather in the nature of a Progress Report, intended to show what has been done and the results so far obtained.

THE EGG.

The egg has only been found on a few occasions in the field, being difficult to detect. In February, 1921, a single egg was found lying loose amongst the decaying leaf-bases at the crown of the corm of a living plant. In the same month a single egg was found deposited in a slight furrow in the side of a larval tunnel in an old corm lying on the ground. At the end of May, 1921, a number of eggs were found deposited in corm and old stems lying on the ground.

In the office, in April, 1921, two eggs were found in a small piece of corm on which beetles had been feeding in a tin; one was deposited in a small furrow in a slight indentation on the surface of the corm; the other was just below the surface. At the end of May and throughout June, 1921, a large number of eggs were obtained from pieces of corm on which beetles had been feeding in tins.

In every case so far noted the eggs have been laid singly and, where below the surface, in a slightly curved burrow only large enough to hold the egg, which is just beneath the surface.

From observations made on cut-stems lying in the plantations, it was found that the site for the deposition of the egg, in such cases, is usually within two feet of the cut end, and just beneath the surface. In cases where corm is attached to the stem, the site of deposition of the egg is apparently close to the crown of the corm.

* Cosmopolites sordida, Chevr. (Curculionidæ).

From the eggs obtained, as stated above, a great deal of valuable information is being obtained. The first sign of the development of the larva within the egg is made manifest by the appearance of the jaws as fine brown lines; the period elapsing from the time of deposition to this stage of development was from thirteen to eighteen days, as noted during May and June, 1921. The period subsequently elapsing until the emergence of the first larva has been found to be from one to three days. The total period, however, from the deposition of the eggs to the emergence of the first larva was from seventeen to twenty-one days during the same two months.

PLATE 41.—EGGS C. SORDIDUS IN SITU IN CORM.

It has been found difficult to breed from the egg after transference, owing to fungus growths developing in any incision made in the plant or piece of corm.

THE LARVA.

The larva, during the warmer portion of the year, has been found to take from three to four weeks to reach maturity. Larvæ collected in the field in April and May, 1921, being then in a well developed state, remained in the larval form for more than four weeks before pupating, after transference, in the office.

In the stools, the larvæ feed principally on the corm (or bulb) of the banana plant, although sometimes they are found to have tunnelled well up into the central core of the stem; this was more commonly

observed in the stems after removal of the bunch, when decay had begun to set in. When found infesting cut-stems, the central core was always found to be the principal, if not the only, area attacked by the larvæ.

The damage which a single larva can do is considerable. In one case the corm of a sucker of Lady's Finger banana, about two inches in diameter, was found to have had practically the whole of the centre eaten out by a single larva.

It is extremely difficult to arrive at a fair comparison between the amount of damage done and the degree of infestation, owing to the variation in habits shown by the larvæ, which sometimes have been found to remain in one area and eat that right out, whereas at other times they tunnel in all directions individually.

PUPA OR NYMPH.

From nymphs collected in the field, the beetles have been found to emerge in from two to seven days; the age of the nymphs, when collected, was unknown. The nymph from a larva maturing in corm in the office at the latter end of May, 1921, occupied fourteen days in reaching maturity.

The pupal chamber in the corms has been found always to be situated below ground level, close to the surface of the corm at the end of a larval tunnel. The position of the pupal chamber in relation to the axes of the corm varies: it is sometimes found parallel with the horizontal axis, sometimes slightly inclined to it.

In cut-stems the position of the pupal chamber varies considerably. Although it is generally just under the surface, it has been found as far as two inches in from the surface.

Occasionally a few strands of fibre are found in the open end of the pupal chamber; so far as has been observed, this is exceptional.

As the pupa approaches maturity it changes colour from a pale yellow through light brownish yellow to a light reddish brown, which is generally the colour of the beetle on emerging.

THE BEETLE OR IMAGO.

After emerging from the pupa, the beetle lies dormant in the pupal chamber for several days, by which time the tissues have hardened and the colour changed to a very deep reddish brown or even black. Immature imagos, removed from corms and cut-stems, have been found to lie dormant, when placed in tins with corm over earth, for from four to five days before showing any marked inclination to move or feed. In nearly all cases the beetles had developed their full (black) colour within seven days. The mortality amongst immature beetles transferred in this way is very high.

Notwithstanding that the beetles have large and well developed wings, the experiments so far carried out to test their power of locomotion in air have not demonstrated that they fly. Neither by any method so far tried has one been able to be made to fly.

Ordinary white light exercises a strong deterrent action on the beetles, which, upon exposure to it, crawl away into any dark place; if they be placed on soil and then so exposed to the light, they will work their way beneath the surface and remain there. A number of coloured lights are being tested, particularly to ascertain, if possible, if there be

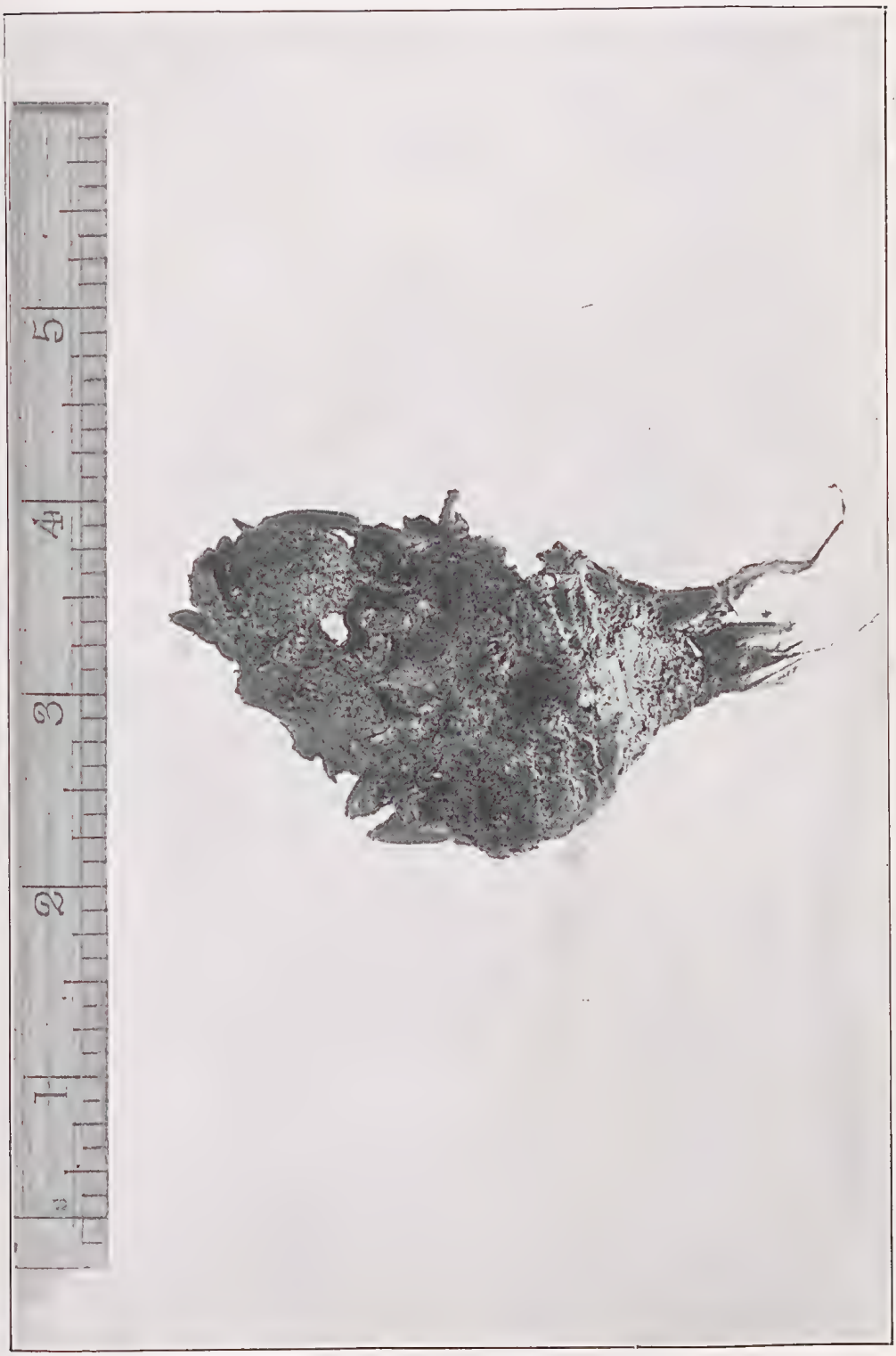


PLATE 42.—WORK OF TWO LARVÆ OF C. SORDIDUS ON BANANA SUCKER.—EXTERIOR VIEW.

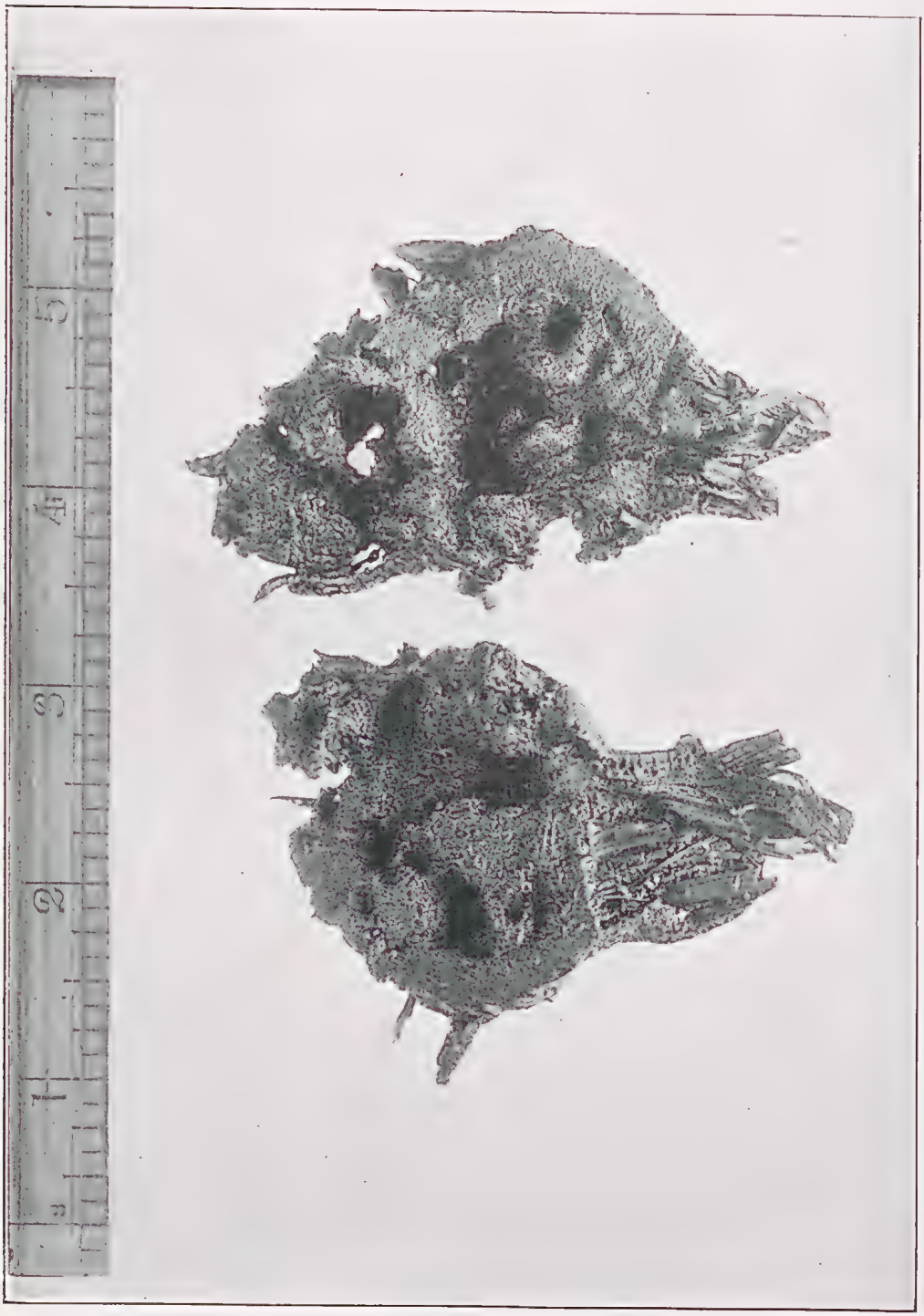


PLATE 43.—WORK OF TWO LARVÆ OF C. SORDIDUS ON BANANA SUCKER.—INTERIOR VIEW.

a colour under which the beetles, even if not markedly attracted to it, will not be driven away. No marked positive results have, so far, been obtained.

Several oils and essential principles are being tested in order to ascertain any attractive or deterrent influences exercised by them on the beetles. All those tested to date have shown a more or less marked deterrent influence, which, however, has only been exercised over a very short distance and for only a very short space of time.

Plate 44.—The Beetle.

A detailed account of the tests on the powers of locomotion and with the oils and coloured lights will be given at a later date, when a greater degree of conclusiveness has been reached than at present.

The food of the beetle consists of the corm or the material of the rotting stems. In most areas, rotting stems, *particularly* those lying on the ground, are always found to contain beetles, often in numbers. The amount of moisture in which the beetles live in these situations is remarkable. The beetles may not be present in the rotting stems solely for the purpose of feeding or propagation, but that of sheltering.

In order to ascertain the longevity of the beetles, a number have been kept in tins containing fine earth and corm; the earth absorbs any moisture from the corm on which the beetles feed. The following table shows the percentages alive on the dates given, the percentage being taken to the nearest whole number:—

Lot.	Approximate date collected, &c.	Number collected.	% alive on 3-3-21.	% alive on 22-3-21.	% alive on 4-4-21.	% alive on 19-4-21.	% alive on 28-4-21.	% alive on 9-5-21.	% alive on 20-5-21.	% alive on 25-5-21.	% alive on 27-5-21.	% alive on 8-6-21.	% alive on 10-6-21.	% alive on 13-6-21.	% alive on 16-6-21.	% alive on 20-6-21.	% alive on 22-6-21.	% alive on 24-6-21.	% alive on 27-6-21.	% alive on 29-6-2n.
A ..	29-1-21	38	78	74	68	68	66	63	63	61	61	61	61	61	61	61	61	61	61	61
B ..	7-2-21	132	97	69	54	34	32	31	31	31	31	31	31	30	30	30	30	30	30	29·5
C ..	12-2-21	281	83	56	52	37	36	36	36	36	35	34·5	34·5	34·5	34·5	34·5	34·5	34·5	34·5	34 5
D ..	20-4-21	37	..	..	..	..	100	92	89	89	89	89	89	89	89	89	86	86	86	86
E ..	27-4-21	16	..	..	..	..	100	88	56	56	56	56	56	56	56	56	56	56	56	56
F ..	5-5-21	87	..	..	..	..	..	100	100	100	100	99	99	99	99	99	99	99	98	98
G] ..	21-5-21	379	..	..	..	..	..	..	100	99	99	99	99	99	99	99	99	99	99	99
H ..	24-5-21	26	..	..	..	..	..	..	..	100	100	100	100	100	100	100	100	100	100	100
I ..	4-6-21	324	..	..	..	..	..	..	..	..	..	100	100	100	100	99	99	99	99	99

With the exception of "Lot E," which were bred from nymphs, all the beetles were collected in the plantations, their age when collected being, of course, unknown. These observations show that the length of life of the beetle is of considerable duration.

The only insect-enemy so far discovered is the Elaterid larva first reported by Tryon from Cooroy. This predaceous insect has not been found outside the Cooroy district. A single larva was met with on the 25th February, 1921, with a partially consumed banana beetle in its jaws.

On several occasions it has been observed that, immediately after heavy rain, the number of beetles found under corm baits was very much less than before the rain. Generally, forty-eight hours after the cessation of rain the number of beetles found under the baits again begins to increase. So far the location of the habitat of the beetles at these times has not been definitely determined.

Under ordinary conditions, a proportion of the beetles shelter and move below the surface of the ground, as shown by the fact that baits laid adjacent to stools, and from under which the beetles have been removed in the morning, have been found to have additional beetles underneath them at midday; and after removing this second lot of beetles, the baits have been found to have further additional beetles underneath them in the late afternoon. An alternative explanation as to their source and mode of access to the baits appears to be excluded on considering the fact that the beetles have been proved to be abhorrent of ordinary light, and, though a close observation has been made, have never been found crawling on the surface of the ground during the hours of daylight, or at any time traversing the air.

OCCURRENCE.

In plantations in which, generally, the infestation is very marked, suckers are commonly found in which the larva has eaten out the centre of the corm and tunnelled upwards through the central core of the

stem to a height of about four inches above ground level, where it has eaten its way right round the stem. These suckers, naturally, look very unhealthy, and if an attempt be made to pull them out of the ground, they break off at this ring-tunnel; a well-developed larva is then usually exposed.

An unusual habit of the larva, observed so far only in one locality, is that of tunnelling upwards right through the centre of the stem of young suckers. This has been observed on the higher ground as well as on the lower levels. Although not of common occurrence, it is sufficiently prevalent to be noticeable.

The infestation of the beetle-borer is equally bad in plantations situated on the high ground and on low-lying levels, and is as severe on the ranges as on the seaboard.

In older plantations where the infestation is slight, the depredations of the larvæ may be confined to old corms in the centre of the stools or cut-stems lying on the ground. This does not mean, however, that such will necessarily be the case under all circumstances.

So far as has been observed, there does not seem to be any marked difference in either the relative frequency of, or the relative injury by, the pest with respect to "Cavendish," "Lady's Finger," or "Sugar" banana plants.

Corms dug out or stems with corm attached, left lying on the ground, may serve as breeding centres for a considerable time. In one case, in an area in which the beetles had been long established, corms which had been dug out four years previously and left lying on the ground were found to contain a number of larvæ and nymphs in addition to over 100 beetles, many of which latter were immature.

CONTROL.

It has been impracticable to enter upon investigations into means of controlling the pest to any extent. The only recommendations that can be made are, in effect, those previously published.

Wherever infestation is found in the stools, dig out and destroy all infested material and lay "split-corm" baits flat on the ground in the centre of and just outside these stools. Examine the "baits" at least each morning, and collect and destroy the beetles that will be found on the underside of the bait and on, or just underneath, the soil under the "bait." It has been noted that about three days elapse before the corm "baits" attain their maximum attractive power. It is advisable to destroy the baits after a fortnight has elapsed, in order to prevent any larvæ, from eggs deposited in the corm, from maturing. Cut-stems and plants that have fallen out of the stools must be examined from time to time, and where found to be infested must be destroyed.

The spreading of the pest into clean plantations is most carefully to be guarded against. When obtaining suckers for planting, the greatest care should be taken to ascertain that the plantation from which they are to be secured is free from banana beetle infestation. Eggs may be deposited in the suckers before or after removal from the stool, and the presence of the eggs, the detection of which is extremely difficult under the circumstances, if not impracticable, or even larvæ, be not noticed at the time of receipt.

Another factor that is too often lost sight of—a particularly important one when laying out a new plantation—is the presence of old banana cultivation adjacent to the area selected. It has been noticed that new plantations have been laid out adjacent to, and even alongside

of, old and often discarded banana cultivations in which the beetle-borer is still active. The beetles will ultimately spread from such old areas into the new plantations. In such cases the old area should be most carefully examined, and, if beetle-borer infestation be found, "baits" should be laid around the edge of, and, as far as possible, throughout the old area; all the beetles so "trapped" must be destroyed. It is to the growers' own advantage to dig out and destroy the plants in such old areas whenever opportunity offers.

NOTE.—This account of banana beetle borer investigations was issued as a special Bulletin by the Entomological Division of the Department of Agriculture and Stock at the Brisbane Exhibition, 9th August, 1921.

SPECIAL CATTLE FATALITY IN THE MARANOA DISTRICT, AND ITS RELATION TO THE LARVÆ OF PTERYGOPHORUS ANALIS, COSTA.*

BY HENRY TRYON, Entomologist, Department of Agriculture and Stock.

The peculiar fatality (Note 1) experienced by cattle, and attributed to their having developed a strange appetite for a special insect (spoken of erroneously as a "caterpillar") that has been reported from Roma during the present month (July, 1921), was experienced by graziers in a considerable area of the Maranoa district in 1911, 1913, and 1914, in annually increasing extent, occurring latterly as far as Moola Zembla Creek, beyond Westgrove, to the north of Roma, and to Waterhole Creek in the Surat district, to the south.

This occurrence at that time, as during the present season, was moreover restricted to a definite area of country characterised by the growth of a certain eucalypt tree—the Silver-leaved Ironbark with opposite leaves (*Eucalyptus melanophloia*, F. v. M.). This tree is the especially favoured food-plant of the insect now to be described. A second one to which it is much less addicted to feeding on is the local "Molly Gum." (Note 5.)

THE INSECT.

The insect, denominated a caterpillar, is not the young of a moth or butterfly, as is implied in the definition; but the young, or "grub," of a large hymenopterous insect—one of our Sawflies (so termed from the fact that the female is endowed with a saw-like organ that is employed in placing its eggs). It was named in 1864 by an Italian entomologist, G. Costa, *Pterygophorus analis*, owing to the male individual having feather-like feelers (antennæ). In addition to the saw-fly grub, then, we meet with the insect in other phases of existence—the winged insect, the egg, and the pupa or nymph.

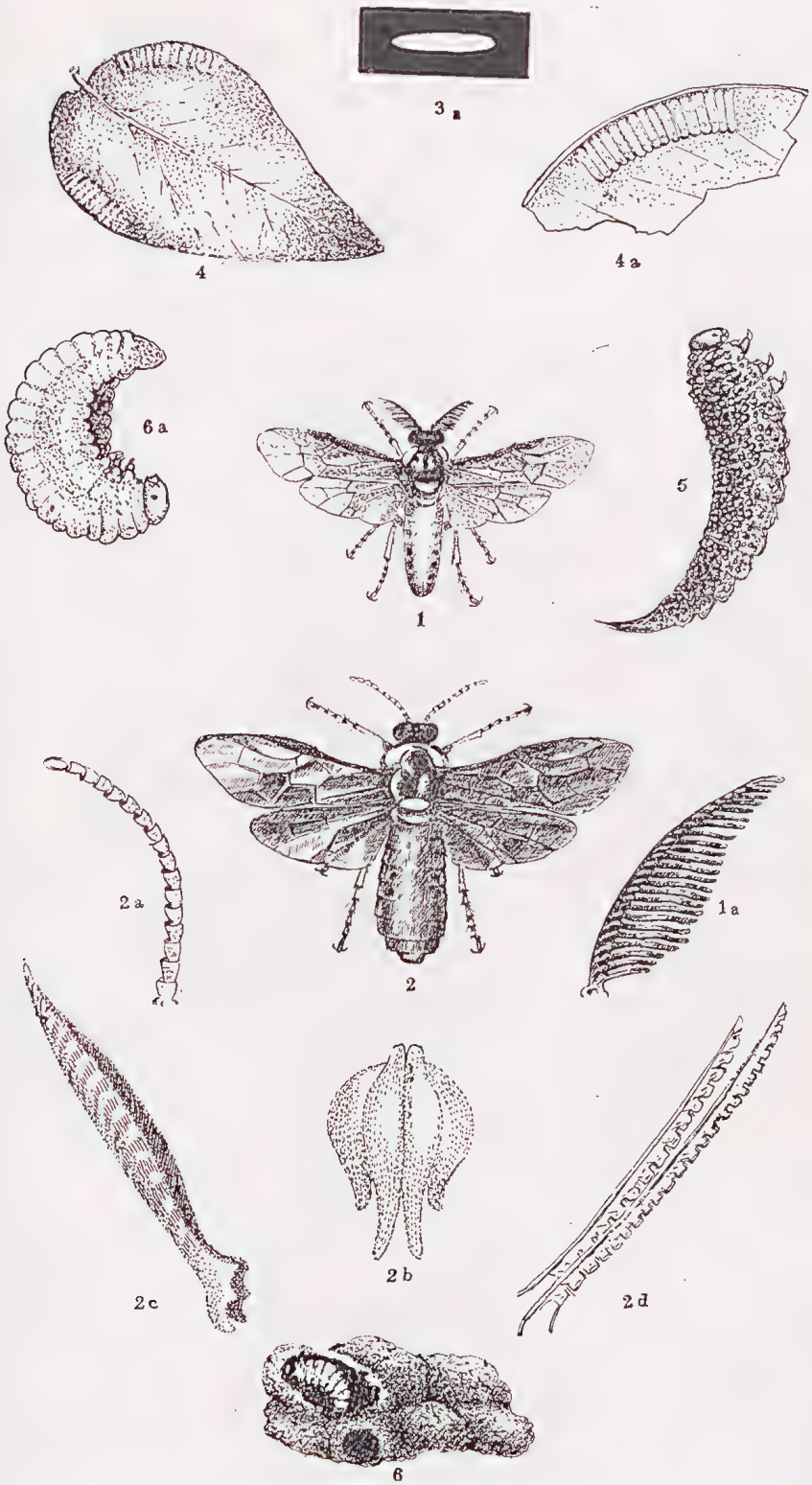
DESCRIPTION OF INSECT AND HABITS.

Adult.—The Sawfly, *Pterygophorus analis, Costa* (Plate 45, Figs, 1 and 2). This is a glossy blue and yellow insect with the shining wings appearing almost black when folded, but really smoke-coloured, darker in front. It has the head and central shield of the thorax and some parts beneath dark steel blue. The female—the larger insect—measures about 1½ cm. in length, and has a wing expansion of just twice this amount. It has its feelers threadlike. On its yellow abdomen beneath is the groove containing the saw-like organ and other instruments that are used in placing the eggs. The male (Fig. 2) on its part measures 1¼ cm. in length, with wings of the same relative length. It is more slender than its consort, and has the black feelers widely feathered on one side.

Egg.—The egg (Fig. 3) is an oblong, very delicate pale green object. The female lays several at a time—twelve or more. These it inserts into the tissue intervening between the two leaf surfaces side by side in a row along the leaf-edge (Figs. 3 and 4). In effecting this object, it settles astride on the latter, and exserting its saw, cuts a cleft for each egg, and then passes an egg into this. (Note 2.)

Larva.—The larvæ hatching from single rows of eggs at one time feed on the leaf where born, congregated together side by side, thousands of leaves on individual trees affording the different groups sustenance. Meanwhile, they may invade leaf

* This memorandum was submitted at the request of the Minister of Agriculture, and although based on investigations and inquiries made in 1914, it has application to the present occurrence in July, 1921. A special show-case illustrating fully the insect and its life history, the work of Hubert Jarvis, has been exhibited several times since the earlier date at the annual expositions of the Queensland National Association.



Del. Hubert Jarvis.]

PLATE 45.—SILVER-LEAF IRONBARK SAW-FLY (*Pterygophorus analis*), G. Costa. [Tenthredinæ.]

after leaf. When fully grown (say, late in June) they crawl, forming a numerous host, along the branches and down the tree trunk to the ground, where they may congregate literally in heaps about its base, either to eventually enter the soil near at hand or to succumb to wet and cold (Plate 46). They are green unclothed caterpillar-like objects, with reddish-yellow horny heads; the bodies gradually taper backwards to a point. (Note 3.)

Nymph and Cocoon.—Having entered the ground, the larvæ still congregated together, form cocoons of a very tough, gummy, dark-coloured material. These are ordinarily placed side by side, and together they appear like blocks of exceedingly large-celled honeycomb. However, when the "grub" enters sandy soil to transform, its cocoons are made isolately, or two or three only occur adherent (Fig. 6). In these dwellings, one in each, the grub passes to the pupal state. In this it is a pale green object, lighter anteriorly, with the four wings and legs packed up in cases lying alongside the sides of the body. Under ordinary circumstances, the adult saw flies, male and female, emerge from the ground late in August or during the succeeding month. However, the time of appearance may be greatly retarded should conditions of drought obtain. This remark also applies to the development as nymphs from larvæ.

The larva and nymph, when crushed, have a strong odour of eucalyptus, and evidently some eucalypt oil finds presence in its body fluids.

CONDITIONS INFLUENCING PREVALENCE.

(1) *Opossums.*—When, nearly forty years since, the Maranoa district was being traversed, it was observed that these animals were very numerous indeed, and that they specially favoured the young foliage of the Silver-leaf Ironbark (*E. melanophloia*, F. v. M.) in feeding; in fact, the foliage they would render quite scanty. The same trees also yielded them abundant camping places. It has been above pointed out that it is within the leaf tissue, the younger especially, that the eggs of the saw fly are deposited. Thus, whilst feeding on this vegetable diet, they would also inevitably consume the "caterpillar" eggs that it contained; similarly, in reducing the foliage they would limit opportunities for egg-laying also. This being so, the enormous destruction of opossums in the Maranoa district during the last decade, and the prevalence of the saw-fly larvæ, and so of this cattle fatality, stand in the simple relation of cause and effect.

(2) *Tachinid Fly Parasite.*—A small dipterous insect, somewhat resembling an ordinary house fly, has been bred from the *Pterygophorus* larva. There is reason to conclude that under some circumstances, and in some seasons, this parasite acts as a formidable natural enemy in preventing the ordinary numerical development of the insect. On the other hand, there are conditions that act prejudicially to it, and so fail to restrain this. So, then the "caterpillar" does not uniformly increase in numbers from year to year under the operation of other favouring circumstances.

(3) *Meteorological Conditions.*—Moreover with the prevalence of drought, although then the saw-fly larvæ ("caterpillars") may enter the ground, to build cocoons and transform to pupæ, the realisation of this stage in their metamorphosis may be long suspended, since then they still persist within these constructions, in the grub condition. During the several months that may be thus occupied without the ordinary transformations taking place, many succumb to fungus and other diseases.

(*b*) When, on the other hand, rain and humidity are experienced, as the "caterpillars" descend from their feeding grounds in the tree tops and are reaching the ground, so prejudicial are their effects on them that myriads may succumb and decay. This may bring about fatality in stock, whilst it considerably abridges the insect's ordinary prolificness.

(4) *Natural Enemies—Birds.*—We have alluded to the operations of opossums and tachinid parasites. The potential controlling influence of insectivorous birds must not be overlooked. Their service can alone, however, be exercised when they locally exist in numbers. The paucity of such friendly agents in the Maranoa district, as compared with what occurred in years past is, however, such that to-day the check that birds might exercise on the number in which these pernicious insects occur is little indeed.

EATING OF THE INSECT BY CATTLE.*

In the absence of personal observation†, allusion may be made to abundant testimony, as establishing the fact, not only that cattle eat the so-called "cater-

* When the cattle fatality was first remarked in the Roma district, it was attributed to "cyanide poisoning" (accidental); the part played in it by insect ingestion must therefore be shown.

† Local inquiry on the part of the writer in 1914 was alone practicable when the insect had already temporarily disappeared.

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PLATE 46.—SILVER-LEAF IRONBARK SAW-FLY (*Pterygophorus Analis*) G. COSTA. (Tenthredinæ). Caterpillar Stage.

pillars,'' but that they may also manifest special keenness in exercising this abnormal appetite for them, as they occur congregated at the immediate feet of their host-trees, the Silver-leaved Ironbark, and Molly box trees—Eucalyptus sp., to a much less extent.

The fact that it is an abnormal appetite is evident from the experience of the 1911 occurrence, and from the 1914 one especially, ''There is plenty of grass . . . my stock have a craving for green feed, and take to the caterpillars'' (S. Sidney, August, 1911). The cattle ''had plenty of good grass, but much preferred eating caterpillars'' (J. C. Boyce, 26th August, 1914).

It is evident, too, that, however this strange habit has originated, the cattle eventually display especial eagerness in securing and consuming the insects. ''I have seen the animals deliberately eating the grubs,'' stated J. D. Thomson. ''Cattle fight for a place in their efforts to satisfy their craving for the larva'' (S. Inspector J. E. Smith). Again, ''When the cattle get a taste for them they go nearly mad; they turn from tree to tree licking them off the trees a foot at a time'' (S. S. Bassett, August, 1914).

EATING THE DEAD INSECTS.

Testimony as to cattle consuming the living insects is not quite conclusive. It is very significant, however, having regard to the effects produced, that they commonly partake of the dead ones. It was reported concerning experiences at Westgrove, in 1913, that the cattle victimised were ''eating heaps of dead caterpillars'' (S. B. Harding); again, ''I personally saw cattle eating up the heaps of rotting caterpillars —stinking heaps of caterpillars'' (Ib.)

Staff Stock Inspector J. Taylor elicited also similar testimony in 1914—*i.e.*, that ''The caterpillars die in heaps and are licked up by the cattle after they become a putrid and semi-putrid mass.'' (*Note.*—The writer has himself observed the masses when they had dried up.) (Note 4.)

OCCURRENCE IN ''STOMACHS.''

The insects being of a soft consistence, with somewhat tough skins, but having hard chitinous heads, would, it might be anticipated, if eaten, generally escape detection on any ordinary examination of the paunch-contents of the cattle that had eaten them. The following testimonies are, however, decisive of their occurrence therein:—(1) ''We have found the ' caterpillars ' in the paunches of the dead ones'' (R. C. Lethbridge, 1913); (2) ''I opened about sixty-seven head here (Toogoombilla), and half of them had the heads of caterpillars in their paunches'' (D. Penthalwick, 1914); (3) ''I have found them in the paunch'' (J. W. Ward); (4) ''I opened several of the dead bullocks, and some were full of caterpillars; others had only a few in their stomachs'' (J. C. Boyce); (5) ''I have found portions of them in one cow's stomach, but I shot her before she got to the dying stage'' (S. R. C. Hardy).

ABSENCE OF INJURY ON EATING.

It would appear that not only may the insects be present under circumstances under which they might be partaken of, but also that, this being so, they may on occasion eat them with impunity. Mr. D. Smith, of Stewart's Creek, Roma, on this point stated:—''Cattle have been in a paddock very much infested with ' caterpillars,' and only a few died (2 miles away, 60 out of 100 head died). . . . I find that on parts of the run the cattle do not die so much, although the ' caterpillars ' are just as thick'' (as elsewhere), and ''I have seen the cattle eat the ' caterpillars ' and they are still living.''

Again, Stock Inspector J. E. Smith stated in 1914 that he had heard that the ''caterpillars'' occurred at Tarrawanya, 35 miles south-east from Roma, but had not learnt of any casualties in connection therewith. Without fatality, too, he had himself seen, whilst specially patrolling the Surat cattle-grazing area, in August, ''occasional patches of stripped ironbark trees, evidences of ' caterpillar ' invasion.'' (*Vide* also ''Diet Deficiency,'' p. 213.)

FACTS CONFIRMATORY.

This evidence, bearing on the generally locally admitted conclusion that the ingestion of the insects alluded to has been the cause of the sickness and death of cattle experienced, finds corroboration in the fact that on moving the cattle from the country in which the insects and their food-trees occur, this loss and injury cease. ''Last winter (1913) about 100 head of cattle died from the effects of eating ' caterpillars ' on Westgrove. . . . Three years previously (1911) about the same number died from the same cause. This winter (1914) I shifted all the sick from the infected country and had no losses'' (S. C. R. Harding).

(So also with regard to influence on occurrence of host-tree destruction.)

FACTOR OF DIET DEFICIENCY, &c.

It is well known that cattle under certain conditions and circumstances exercise abnormal appetites for one object or another—bones especially—as do also human beings in the case of soil or grit. Partaking of insects living or dead and decayed comes within this definition, and calls for explanation to be understood. In this connection a testimony as to the possible action of salt (sodium chloride) may therefore have some significance:—"I have lost 20 head of cattle through the pest. Mr. ————, one of my next neighbours, lost 75 head. In one paddock *where I salted*, they (the ' caterpillars ' H.T.) are very thick, and the cattle don't seem to notice them, although they (the cattle, H.T.) are running from tree to tree looking for them in the paddock where I had no salt" (J. Jenkins, Timor, August, 1914).

The instinctive habit of endeavouring to overcome irritation in the alimentary canal from the presence of entozoa, by consuming non-food substances, must, too, be considered in this connection.

FACTOR OF WEATHER CONDITIONS.

In the season of any year when the insects are prevalent, and wet damp weather is experienced, the special loss in cattle now under consideration most prevails. This has been especially commented upon by Alexander Cummings, of Mount Beagle. When it is considered that the death of the insects arises, too, under the same circumstances, this relation may be understood, if, indeed, not accounted for.

AGE OF CATTLE AFFECTED.

The experience of graziers has been that it is principally young cattle that have evinced the peculiar fatality. "We have lost principally calves," stated J. D. Thomson. Again another testified, "I lost five young cattle" (A Cummings). Another, as to the animals affected, "They are principally young cattle up to 2 years old and in the best condition." A settler at Stewart's Creek (D. Smith) deposed, further, "Six head of weaners died out of eighteen, none of seven grown cattle."

This is not, however, the universal experience. Thus we learnt from J. C. Boyce, of Mooya, that he lost 40 bullocks from the cause alluded to (partaking of saw-fly grubs), several of which he opened. Again, referring to a particular holding, J. O. Thomson, of Kilmorney, stated, "I have seen 50 to 60 head of 2 to 3 year old steers dead on an average of about 4 to 5 square miles."

SYMPTOMS ARISING FROM THE INSECT DIET.

The clinical symptoms are a subject for the veterinarian to describe. Those that have attempted to picture them, in the absence of the necessary technical knowledge and experience, have failed. Evidently they are rather slowly realised, but take the form of much pain and distress. They certainly, according to all testimony, result in marked cerebral phenomena.

The patients "become restive" (J. D. Thomson); "they appear to suffer great pain" (J. W. Ward); "the affected beast becomes quite mad. It is very dangerous to approach" (Ib.); "they get staggers, also will charge very fiercely if one goes within 50 yards of them" (S. R. Harding).

The pathological state, revealed on post-mortem examination, had again only been indefinitely described when our information was elicited. This, again, is a matter for the veterinarian and animal pathologists.

With reference to the incidence of a fatal issue, it has been stated that "only very few recover after eating the caterpillars." "Three of mine recovered," stated the deponent alluded to (J. C. Boyce, of Mooya). He mentioned one animal that went without grass for fourteen days and then pulled through. "Some recover, too," stated Mr. E. D. Smith. Death, again, is rather slowly realised. Some cattle die in twenty-four hours, but usually only after a lapse of three to four days. "The time the animal eats the insects until the time of death is two to three days," stated D. G. Thomson.

SUMMARY AS TO CAUSE OF FATALITY.

1. Cattle under certain circumstances—those herein suggested above or others (a matter to be inquired into by the animal pathologist)—exercise an abnormal appetite and consume the grubs of a saw fly available in quantities, principally when dead and decaying; as also may happen with respect to true caterpillars and animal matter generally.

2. The symptoms as far as ascertained are not those arising from the consumption of ordinary hairy caterpillars (*Liparidæ*, &c.), these in the latter case being those of intense local irritation due to the presence of the peculiarly constructed hairs (so also with respect to Eucalyptus oil).

3. On the other hand, they appear to be not inconsistent with those of a generalised toxæmia when a ptomaine has become operative—a matter for the animal pathologist to decide.

MEASURES OF CONTROL.

Apart from the direct treatment of the cattle, which it would appear should be undertaken from two distinct standpoints—prevention and remedy—certain other procedures may serve to reduce the fatality that may occur.

1. *Medical Treatment.*—This is a matter for the veterinary practitioner, and possibly the difficulties with which it is fraught are not insuperable. It might be affirmed, as already suggested (p. 213), that in this regard the discovery of the origin of the abnormal appetite displayed by the cattle, and of precisely in what it consists, might point to a practical procedure for its removal or subjugation.

2. Other procedures above alluded to, being of the nature of preventative ones.

(*a*) *Local Protection of Opossums.*—Under "Factors contributory in opposition to numerical increase" of the insect. Emphasis has been made on the effect of reduction of opossum life in making for their prevalence, and how this reduction has operated to effect this result (p. 210). It is considered, then, that a close season for these animals throughout the area in which the Silver-leaf Ironbark (*Eucalyptus melanophloia*) grows and the saw fly (*Pterygophorus analis*) is using it as a host-plant, would be in the distinct interest of the grazier, whose cattle were liable to suffer.

(*b*) *Movement of Cattle from Areas of Ill-Repute.*—The host-plant of the caterpillar (saw-fly grub) grows principally in belts and patches, and in many cases it is practicable to withdraw them from these to grazing country, where the tree and its associated insect does not occur. Their pasturage on such new country need only be for about two months—last week in June to end of August. This method of safeguarding them effectively was demonstrated by S. R. C. Harding, manager of Westgrove, in 1914.

(*c*) *Destroying the Silver-leaved Ironbarks* (*E. melanophloia*, F.v.M.) in country has to be permanently devoted to cattle-grazing—by ringbarking. This has already been done to a large extent in the past. The "application for permission to ringbark," that has to be made to the local Crown Lands Commissioner in accordance with the requirements of the "*Land Act of* 1910," in Crown leaseholds is not likely to be withheld, seeing that the tree in question has no great value as a timber tree, and its local destruction would not apparently constitute sufficient forest reduction to minimise local rainfall.

(*d*) *Preventing Access of Stock to Caterpillars.*—Trees on which the insects are feeding can be recognised as such, and in practice it has been found that if boughs are placed at the bases of their trunks they will serve to debar access of cattle bent on reaching the insects that may congregate in masses in those positions.

Note.—It is anticipated that a strongly odorous substance sprayed upon the insect masses would also deter cattle visitation—"bone oil," for example. This is a matter for experiment.

(*e*) *Native Bird Protection.*—The very marked reduction in bird life in the Maranoa district, during the last three or four decades, principally brought about by "cyaniding" on the part of opossum and native-bear hunters, must be brought to a standstill, and an effort to encourage it stimulated. That special insectivorous birds destroy the "caterpillar" has not been observed by us, but that such is the case is highly probable; even the small parrots may serve this purpose.

(*f*) *Special Investigation into Pathology.*—It would seem probable that special investigation on the part of the animal pathologist are called for and likely to yield material results in reducing this cattle fatality.

SUPPLEMENTARY NOTES.

Note 1.—Although loss of stock, attributed to consumption of the saw-fly larvæ ("caterpillars"), has also been reported from other parts of the Maranoa area without details as to the number of victims, the following specific instances, in most of which this information is given, will be sufficient to indicate its seriousness:—

1911.—Reports were received as to its occurrence at Westgrove, Pinegrove, and Upper Yingerbay, 100 head (R.B.C.).

1913.—Similar reports were made with respect to Forest Vale, Stewart's Creek, Kilmorey, Westgrove, about 100 head (S.R.C.H.), Mount Beagle (A.C.), and Mr. Eden, 100 (A.C.).

1914.—In this year, again, the following losses were brought under notice:—Bungeworgorai, 16; Bungeworgorai, 30 (Mrs. L.); Roma, 15 bullocks (S.S.B.); Mooga, 30, including 20 bullocks (J.C.B.); Westgrove, several; Hutton Creek, 50 of 400 head (— McC.); East Lynne, 70-80 (J.W.W.); Timor, 20 (J.J.); Kilmorey, about 100 (J.D.T.); property adjoining Timor, 50-60 (Ib.); Stewart's Creek, 50 of 300 head (G.D.S.); Stewart's Creek, 60 of 200 (J.M.); Mount Beagle, 5 before cattle generally were removed; Mr. Eden, 100 (J.W.L.).

1921.—The occurrence in this year of fatality in cattle arising under the circumstances mentioned has not personally been inquired into, but the following statement in the Press will serve to show the extent to which it has been experienced:—"It can be proved that thousands of head of cattle in this district (north of Roma) alone have died as the result of eating these 'caterpillars.' On the road from Forest Vale to Eddystone Vale, dozens of carcasses can be counted in the timbered country from the roadside, and travellers are hardly clear of the stench from Simpson's Creek to the former station."—Mitchell correspondent in *Queensland Grazier and Farmer*, Brisbane, 4th August, 1921. (*s.v.* "Caterpillar Plague—Mortality in Cattle.")

Note 2.—The special organ used in making provision for the deposition of the eggs and the act of oviposition itself are alike remarkable. Generally speaking, the former consists of two elongated bodies, resembling the five sides of an ovate lanceolate leaf that are folded together enclosing a cavity, acting both as a sheath and director (Plate 45, Fig. 2c), within the latter being enclosed two elongated horny laminæ, each of which has two series of square-ending teeth on one side (Plate 45, Fig. 2d). These laminæ, although closely adjusted side by side, are capable of independent movement, and utilisable as saws, the four organs being packed in a depression between two lips. The mother insect, when about to lay its eggs, settles with its legs astride, with the ovipositor still concealed in the under abdominal surface, and, this done, it grasps firmly the leaf margin between the two labia or lips that enclose it. The saw fly then arches its body, the hinder dorsum of the abdomen being nearly perpendicular. The director, with the saws that it ensheaths, having its longitudinal groove facing anteriorly, then is freed from the groove between the labia, its tip touching the leaf border just in front of where it is clasped. The saws, with their teeth forward, then commence to move rhythmically up and down, issuing in doing so slightly from the groove in the director. Meanwhile they—the director and saws—enter the slit then gradually opened by their agency; the latter then cut rapidly with a few strokes an oblong chamber. This being made of sufficient size, the saws cease their up and down cutting movement and an elongated egg is then passed into the cavity that it nearly fills, the passage of the ovum appearing as the continuous flowing in of a transparent body of soft consistency. The director is then removed; the labia release their hold, the insect moves forward along the leaf edge about the width of their egg-chamber, and here a similar egg-chamber is made and filled after the manner described beyond the one already made. So successive eggs are placed in a band of egg-chambers forming a ribbon along the leaf margin, the edges of the wound in the leaf margin uniting so closely that not only does no death of the injured tissue ensue, but even the normal leaf-colour is scarcely altered.

Note 3.—The following is a more comprehensive description of the saw-fly larva ("caterpillar") than that given on pages 208 and 210:—*The Larva.*—Elongate, semi-oval in section, with the sides of the body erect, this latter, too, curving upwards and broadened towards the head, and sloping downwards, and narrowed gradually, from the fore-segments backwards, being terminated in a gradually compressed awl-shaped tail. The head is roundish, pale-reddish-yellow, minutely and evenly speckled with colour of a darker hue. The body above is glossy, almost smooth, and yellowish-green, and is gemmed with nitid low round boss-like whitish granules. Of these, two transverse rows, about 6 in. each, of rather larger ones with dark centres, occur on the second and third thoracic segments. The smaller granules vary in size; a row of larger compressed ones, one on each segment, extends longitudinally on each side of the middle line. A reddish suffused patch may cross the insect just proximad of the origin of the "tail." The undersurface is plain, showing eight abdominal segments, sides below projecting slightly outwards, the lower margin being festooned with eight rounder lobes. The thoracic segments, with three pairs of legs, each with a 1-jointed short tarsus, ending in a little rounded tuberosity and a piceous coloured claw. Abdominal segments with five pairs of broad pseudo-podia (false legs), terminally wrinkled. Length, 25 cm.

Note 5.—Whilst, at present, some uncertainty exists as to the identity of the tree, regarded locally as the less favoured food-plant of the saw-fly larvæ, and designated "Molly gum," and that some residents of the district speak of it also as "Gum-topped box," it may be mentioned that a second eucalyptus species that the writer has himself observed to be sparingly fed upon by the insects, has, on the evidence of specimens referred to the Government Botanist (C. T. White), been found to correspond to a plant figured in Maiden's "Critical Revision of the Genus Eucalyptus" (Pl. liii., fig. 15A), that the latter regards as a lanceolate leaf form of *E. melanophloia* (its proper host-plant), and that Bentham, who recorded also that it was the gum-topped box of the Suttor River, referred to a form of *Eucalyptus crebra*. It may be added with regard to the Silver Ironbark, and the insects injurious relative thereto, that not only may several of the "grubs" occur upon a single leaf, but they may be generally so numerous as to completely defoliate, within a few days only, the trees on which they occur—often throughout considerable areas.

Note 6.—The fatality in the cattle, consequent on their having eaten the dead saw-fly larvæ (that may occur after rain to the extent of 90 per cent.), accompanied with the living ones (T. Murray), and that would appear to be due to the action of a ptomaine that it is expected would originate in the decay of these insects, may be likened to the similar result that, as has been stated, often follows the gnawing and even consumption on their part of bones, to which decomposed, though dry, meat may still be attached. It, however, has a more close parallel, in certain experiences in Palestine, described by Samsonoff. This investigator has recorded the fact that in the Hedera district, it had been noticed that the hordes of migratory locusts had either filled with their dead bodies the shallow wells in the neighbourhood of the marshes; or had, on dying in the water, caused it to develop a greenish-yellow colour. Also, that cattle and other domestic animals that had been watered at these wells had succumbed after exhibiting grave cerebral symptoms; whilst similar animals, that had drunk the water of wells to which the locusts had not gained access, or that of running streams, had remained unaffected. (*Vide* Samsonoff—"Intoxication des ruminants par les sécretions du criquet pèlerin." *Rec. Méd. Vet.* 1919, Oct. 15, vol, 95. No. 19, pp. 556-565, and Abstract. *Trop. Vet. Bull.*, vol. 8, No. 1, p. 91-2. Mar., 1920.)

Note 7.—W. W. Froggatt, Government Entomologist, N.S. Wales, in a paper, "Notes on Australian Saw-flies (Tenthredinæ) written in 1918 (Proc. Lin. Soc. N.S.W. 43, 3 Oct.) intimates—under *Pterygophorus analis*, G. Costa (*Ann. Mus. Zool*, Napoli, II., p. 66, 1864)—the fact of cases being recorded from the Roma and Mitchell districts; also, of the death of cattle that have been alleged to have acquired the abnormal habit of eating the larvæ of this insect that are described as moribund; and in support of this statement cites a communication from Mr. Moore, of "The Peaks," Marbango, on the subject, and whose experiences relate to 1917 (*Op. cit.*, p. 671-2).

DESCRIPTION OF PLATES.

PLATE I.—1. Male saw fly; 1A. Antenna of male; 2. Female saw fly; 2A. Antenna of female; 2B. External aspect of groove containing ovipositor, labia, &c.; 2C and 2D. Organs forming ovipositor; 2C. Sheath or director, with joint-structure at one end; 2D. The two saws, separated; 3. The egg; 4. Ribbon of egg-cells within tissue of leaf of *Eucalyptus melanophloia* (reduced); 4A. Another view, eggs exposed; 5. Saw-fly larva (so-called "caterpillar"; 6. Larva within cocoon as formed in sandy soil (reduced); 6A. Larva, removed from cocoon prior to pupation. Note, on comparison with 5, stunted form, &c.

[From Drawings by Hubert Jarvis, Entomologist.]

PLATE II.—The larvæ "caterpillars" descending tree trunks prior to entering ground to pupate, or prior to dying without transformation. Photographic representation.

PARASITIC INSECTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 8th August, 1921, from Mr. Edmund Jarvis, Entomologist:—

INTRODUCTION OF PARASITES.

This matter being considered of importance, preliminary steps have been taken to get into touch with entomologists in those parts of the world where scoliid wasps that might prove serviceable here are known to occur.

Several species of these "Digger-wasps" are obtainable for introduction, and very probably some of them might do valuable work in our canefields.

Before incurring the expense of introducing a parasitic insect, however, the knowledge of certain facts relating to its life-cycle, economy, and environment is essential; as without such information it would be impossible to decide whether a species, if introduced, would, in the first place, be likely to live in Queensland; or, if so, find suitable host grubs, or breed in a normal manner.

With a view to obtaining reliable and comprehensive data of this nature regarding certain species of scoliidæ that appear likely to meet our requirements, I have prepared a list of questions which, when replied to by the various entomologists approached, will considerably illuminate the matter, and enable me in the near future to report more definitely on this interesting form of control.

Bacteriologists who are at present experimenting with different diseases affecting the grubs of cockchafer beetles have also been consulted, and it is hoped that a measure of relief may be secured through the introduction of suitable bacteria, which under our warm climatic conditions should thrive and multiply abundantly.

FUMIGATING CANE BEETLES.

Since the manufacture last year, by Mr. Dawson, of Gordonvale, of a machine for administering carbon bisulphide to the soil, the merits of this fumigant have been rather freely discussed here, and it is proposed to look into the matter this season and conduct a series of field experiments.

Mr. W. F. S. Howe (Manager of Mulgrave Central Mill) happens to have had considerable experience with carbon bisulphide and obtained results against mature cane-grubs which appear conclusive.

I agree with him in thinking that many of the failures in past years resulted from applications having been made either at the wrong time—viz., when the soil was too wet—or in heavy land not properly cultivated.

The best results are usually obtained in well-worked volcanic or clay-loam soils at a time when they are thoroughly moist, but not wet enough to affect porosity. Such conditions generally obtain in light soils about two days after heavy rain, but it is an easy matter to make sure by testing one's land with a spade.

Although carbon bisulphide is much used by entomologists for controlling various soil-frequenting insects, it does not seem to have come into general use here against cane-grubs.

This may be owing to the following reasons:—

1. Its rather high cost.
2. The expense of distributing it by hand-injectors.
3. The difficulty of obtaining reliable men to apply it.
4. The want of knowing exactly *how* and *when* to apply it.
5. Doubts regarding the efficiency, or after effects, of such fumigation.

Now, by adopting some reliable mechanical treatment we at once get rid of objections Nos. 2 and 3, since our field applications would then be performed quickly, systematically, and with certainty, two rows of cane being treated at once by the machine as it passed along between the stools, while the labour involved would consist simply of a driver and one horse.

Seeing that such treatment is not practicable after cane has reached a certain height, fumigation would need to be commenced as soon as possible after flighting of the beetles; for by making an early start we secure a period of two months or more in which to treat young ratoon and late planted crops.

It is proposed, therefore, to direct experimentation during the coming season against the eggs and small grubs, the latter of which will doubtless succumb to ordinary fumigation.

Very little is known regarding the effect of bisulphide on the eggs of scarabaeid beetles, but I am inclined to think that the fumes would most likely penetrate the soft and rather absorbent chorion (egg-shell) of Lepidoderma.

However, this is a point to be determined shortly. Our interest at present centres in the machine and its possibilities, which it is to be hoped may be completed this season in time for Mr. Dawson to give a practical demonstration in the field.

If successful, it might pay us to advance another step, and, as suggested by Mr. Howe, manufacture our own carbon bisulphide, and so reduce the cost about one-half, which would satisfactorily dispose of objection No. 1.

DIPPING FLUIDS.

TABLE A.—Pounds of Arsenic to be added to bring Fluid in Dip up to Standard Strength.

No. of Gallons in Dip	Pounds of Arsenic per 400 Gallons of Fluid found by Analysis.															Deduct for every ½lb. of Arsenic found by Analysis.	Standard Strength at 8 lb.
	Water only 0.	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	
100	2	1·87	1·75	1·63	1·5	1·38	1·25	1·13	1	0·88	0·75	0·63	0·5	0·38	0·25	0·13	lb. 0·06	..
200	4	3·75	3·5	3·25	3·0	2·75	2·5	2·25	2	1·75	1·5	1·25	1·0	0·75	0·5	0·25	0·12	..
300	6	5·63	5·25	4·88	4·5	4·13	3·75	3·38	3	2·63	2·25	1·88	1·5	1·13	0·75	0·38	0·19	..
400	8	7·5	7·0	6·5	6·0	5·5	5·0	4·5	4	3·5	3·0	2·5	2·0	1·5	1·0	0·5	0·25	..
500	10	9·38	8·75	8·13	7·5	6·88	6·25	5·63	5	4·38	3·75	3·13	2·5	1·88	1·25	0·63	0·31	..
600	12	11·25	10·5	9·75	9·0	8·25	7·5	6·75	6	5·25	4·5	3·75	3·0	2·25	1·50	0·75	0·38	..
700	14	13·12	12·25	11·37	10·5	9·63	8·75	7·88	7	6·13	5·25	4·38	3·5	2·63	1·75	0·88	0·44	..
800	16	16·0	14·0	13·0	12·0	11·0	10·0	9·0	8	7·0	6·0	5·0	4·0	3·0	2·0	1·0	0·50	..
900	18	16·87	15·75	14·62	13·5	12·38	11·25	10·13	9	7·88	6·75	5·63	4·5	3·38	2·25	1·13	0·56	..
1,000	20	18·75	17·5	16·25	15·0	13·75	12·5	11·25	10	8·75	7·50	6·25	5·0	3·75	2·5	1·25	0·63	..
1,200	24	22·5	21·0	19·50	18·0	16·5	15·0	13·5	12	10·5	9·0	7·5	6·0	4·5	3·0	1·5	0·75	..
1,600	32	30·0	28·0	26·0	24·0	22·0	20·0	18·0	16	14·0	12·0	10·0	8·0	6·0	4·0	2·0	1·0	..
2,000	40	37·5	35·0	32·5	30·0	27·5	25·0	22·5	20	17·5	15·0	12·5	10·0	7·5	5·0	2·5	1·25	..
2,400	48	45·0	42·0	39·0	36·0	33·0	30·0	27·0	24	21·0	18·0	15·0	12·0	9·0	6·0	3·0	1·50	..
2,800	56	52·5	49·0	45·5	42·0	38·5	35·0	31·5	28	4·5	21·0	17·5	14·0	10·5	7·0	3·5	1·75	..
3,000	60	56·25	52·5	48·75	45·0	41·25	37·5	33·75	30	26·25	22·5	18·75	15·0	11·25	7·5	3·75	1·88	..
3·200	64	60·0	56·0	50·0	48·0	44·0	40·0	36·0	32	28·0	24·0	20·0	16·0	12·0	8·0	4·0	2·0	..
3,600	72	67·5	63·0	58·5	54·0	49·5	45·0	41·5	36	31·5	27·0	22·5	18·0	13·5	9·0	4·5	2·25	..
4,000	80	75·0	70·0	65·0	60·0	55·0	50·0	45·0	40	35·0	30·0	25·0	20·0	15·0	10·0	5·0	2·5	..
5,000	100	93·75	87·5	81·25	75·0	68·75	62·5	56·25	50	43·75	37·5	31·25	25·0	18·75	12·5	6·25	3·12	..
6,000	120	112·5	105·0	97·5	90·0	82·5	75·0	67·5	60	52·5	45·0	37·5	30·0	22·5	15 0	7·5	3 75	..
	..	..	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	..	6 lb.
	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	..	7 lb.

Pounds of Arsenic per 400 gallons of fluid, by analysis.

TABLE B.

GALLONS (AND PINTS) OF LIQUID CONCENTRATES, OR POUNDS OF POWDER CONCENTRATES TO BE ADDED TO FLUID IN DIP, ACCORDING TO POUNDS OF ARSENIC FOUND FROM TABLE A.

Pounds of Arsenic to be added to fluid in Dip.	LIQUID CONCENTRATES.					POWDER CONCENTRATES.	
	1÷100	1÷125	1÷140	1÷160	1÷200	1÷200	1÷250
	Gals pts.	Gals. pts.	Gals. pts.	Gals. pts.	Gals. pts.	Lb.	Lb.
1	0 4	0 3	0 3	0 2½	0 2	2½	2
2	1 0	0 6½	0 6	0 5	0 4	5	4
3	1 4	1 1½	1 0½	0 7½	0 6	7½	6
4	2 0	1 5	1 3½	1 2	1 0	10	8
5	2 4	2 0	1 6	1 4½	1 2	12½	10
6	3 0	2 3	2 1	1 7	1 4	15	12
7	3 4	2 6½	2 4	2 1½	1 6	17½	14
8	4 0	3 1½	2 7	2 4	2 0	20	16
9	4 4	3 5	3 1½	2 6½	2 2	22½	18
10	5 0	4 0	3 4½	3 1	2 4	25	20
11	5 4	4 3	3 7½	3 3½	2 6	27½	22
12	6 0	4 6½	4 2	3 6	3 0	30	24
13	6 4	5 1½	4 5	4 0½	3 2	32½	26
14	7 0	5 5	5 0	4 3	3 4	35	28
15	7 4	6 0	5 3	4 5½	3 6	37½	30
16	8 0	6 3	5 5½	5 0	4 0	40	32
17	8 4	6 6½	6 0½	5 2½	4 2	42½	34
18	9 0	7 1½	6 3½	5 5	4 4	45	36
19	9 4	7 5	6 6	5 7½	4 6	47½	38
20	10 0	8 0	7 1	6 2	5 0	50	40
21	10 4	8 3	7 4	6 4½	5 2	52½	42
22	11 0	8 6½	7 7	6 7	5 4	55	44
23	11 4	9 1½	8 1½	7 1½	5 6	57½	46
24	12 0	9 5	8 4½	7 4	6 0	60	48
25	12 4	10 0	8 7½	7 6½	6 2	62½	50
26	13 0	10 3	9 2	8 1	6 4	65	52
27	13 4	10 6½	9 5	8 3½	6 6	67½	54
28	14 0	11 1½	10 0	8 6	7 0	70	56
29	14 4	11 5	10 3	9 0½	7 2	72½	58
30	15 0	12 0	10 5½	9 3	7 4	75	60
40	20 0	16 0	14 2	12 4	10 0	100	80
50	25 0	20 0	17 6½	15 5	12 4	125	100

TABLE C.—GALLONS (AND PINTS) OF CONCENTRATE TO BE ADDED TO BRING FLUID IN DIP UP TO STANDARD STRENGTH.

Gallons of Fluid in Dip. (For Queensland Dip, Royal Dip No. 2, Australian Dip, 1 ÷ 160.)	Pounds of Arsenic per 400 Gallons of Fluid found by Analysis.																Deduct for every ¼ lb. of Arsenic found by Analysis.	Standard Strength Per 400 Gallons.
	0 Water	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½		8 lb.
100	gls. pts. 0 5	gls. pts. 0 5	gls. pts. 0 4½	gls. pts. 0 4½	gls. pts. 0 4	gls. pts. 0 4	gls. pts. 0 3½	gls. pts. 0 3	gls. pts. 0 2½	gls. pts. 0 2½	gls. pts. 0 2	gls. pts. 0 2	gls. pts. 0 1½	gls. pts. 0 1	gls. pts. 0 0½	gls. pts. 0 0½	gls. pts. 0 0½	..
200	1 2	1 1½	1 0½	1 0	0 7½	0 7	0 6½	0 6	0 5	0 4½	0 4	0 3½	0 2½	0 2	0 1½	0 0½	0 0½	..
300	1 7	1 6	1 5	1 4½	1 3½	1 2½	1 1½	1 0½	0 7½	0 7	0 6	0 5	0 4	0 3	0 2	0 1	0 0½	..
400	2 4	2 2½	2 1	2 0	1 7	1 6	1 4½	1 3½	1 2	1 1	0 7½	0 6½	0 5	0 4	0 2½	0 1½	0 0¾	..
500	3 1	3 0½	2 7½	2 5	2 2½	2 1	1 7½	1 6	1 4½	1 3	1 1½	1 0	0 6½	0 5	0 3½	0 2	0 1	..
600	3 6	3 4½	3 2½	3 0½	2 6½	2 5	2 3	2 1	1 7	1 5	1 3	1 1½	0 7½	0 6	0 4	0 2	0 1	..
700	4 3	4 1	3 6½	3 4½	3 2½	3 0½	2 6	2 4	2 1½	1 7½	1 5	1 3	1 1	0 7	0 4½	0 2½	0 1¼	..
800	5 0	4 5½	4 3	4 0½	3 6	3 3½	3 1	2 6½	2 4	2 1½	1 7	1 4½	1 2	0 7½	0 5	0 2½	0 1½	..
900	5 5	5 2½	4 7½	4 5	4 2	3 7	3 4	3 1½	2 6½	2 4	2 1	1 6	1 3½	1 0½	0 6	0 3	0 1¾	..
1,000	6 1	5 6	5 3	5 0½	4 5½	4 3	4 0	3 4½	3 1	2 6	2 3	2 0	1 4½	1 1½	0 6½	0 3½	0 1¾	..
1,200	7 4	6 9½	6 4½	6 1	5 5	5 1½	4 5½	4 2	3 6	3 2½	2 6½	2 3	1 7	1 3½	0 7½	0 4	0 2	..
1,600	10 0	9 3	8 6	8 1	7 4	6 7	6 2	5 5	5 0	4 4	3 6	3 1	2 4	1 7	1 2	0 5	0 2½	..
2,000	12 4	11 6	10 7½	10 1½	9 3	8 5	7 6½	7 0½	6 2	5 4	4 5½	3 7½	3 1	2 3	1 4½	0 6½	0 3¼	..
2,400	15 0	14 0½	13 1	12 1½	11 2	10 2½	9 3	8 3½	7 4	6 4½	5 5	4 5½	3 6	2 6½	1 7	0 7½	0 3¾	..
2,800	17 4	16 3½	15 2½	14 2	13 1	12 0½	10 7½	9 7	8 6	7 5½	6 4½	5 4	4 3	3 2½	2 1½	1 1	0 4	..
3,000	18 7	17 5½	16 4	15 2½	14 0½	12 7½	11 6	10 4½	9 3	8 2	7 0½	5 6	4 5½	3 4	2 2½	1 1½	0 4½	..
3,200	20 0	18 6	17 4	16 2	15 0	13 6	12 4	11 2	10 0	8 6	7 4	6 2	5 0	3 6	2 4	1 2	0 5	..
3,600	22 4	21 1	19 5½	18 2½	16 7	15 4	14 0½	12 5½	11 2	9 3	8 3½	7 0½	5 5	4 2	2 6½	1 3½	0 5¾	..
4,000	25 0	23 3½	21 7	20 2½	18 6	17 2	15 6	14 1	12 4	10 5½	9 3	7 6½	6 2	4 5½	3 1	1 4½	0 6¼	..
5,000	31 2	29 2½	27 3	25 3½	23 3½	21 4	19 4	17 4½	15 5	13 5½	11 6	9 6½	7 6½	5 7	3 7½	2 0	1 0	..
6,000	37 3	35 0½	32 6	30 3½	28 1	25 6½	23 4	21 1	18 6	16 3½	14 1	11 6	9 3	7 0½	4 6	2 3	1 1½	..
	..	..	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	..	6 lb.
	..	..	Water 0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	..	7 lb.

INSTRUCTIONS FOR USE OF TABLES.

To find the amount of concentrate to be added to the fluid in a dip, ascertain first from Table A the necessary amount of arsenic in lbs., according to the strength of the fluid found by analysis. For instance, if the dip contains 2,800 gallons of fluid, and the analysis showed 5½ lb. of arsenic per 400 gallons, we find that 17.5 lb., or nearly 18 lb., of arsenic must be added to bring the fluid up to the standard strength of 8 lb. per 400 gallons. Should a dip owner wish to use a dip of lesser strength on account of dipping at regular shorter intervals, or during very hot weather, the figures at the bottom of the table may be used, and for an adopted standard strength of 7 lb. for above example only 10.5 lb. of arsenic should be added, and for 6 lb. standard strength only 3.5 lb.

Should the analysis show 5¾ lb. instead of 5½ lb., a slight reduction for the ¼ lb. may be made, using the figures in the last column of the table, this deduction amounting for 2,800 gallons to 1.75 lb., so that 17.5 lb. — 1.75 lb. = 15.75 lb., or 16 lb. of arsenic would have to be added to the fluid in the dip.

If a dip is to be recharged after cleaning out, the amount of arsenic necessary to be added is found by using the column for water (0). A dip of, say, 2,600 gallon capacity would require 48 lb. for 2,400 gallons and additional 4 lb. for 200 gallons, or a total of 52 lb. of arsenic.

To find now the gallons of concentrate or lbs. of powder concentrate, use Table B, and we find that 17.5 lb. or 18 lb. of arsenic is supplied by—

7 gallons 1½ pints of Cooper's Dip (1 ÷ 125).
5 gallons 5 pints of Queensland dip, or Royal No. 2 (1 ÷ 160), and
45 lb. of Vallo Powder Dip (1 ÷ 200).

Table C can be used to find the gallons of concentrate, of a strength of 1 ÷ 160, which is the strength of the majority of concentrates, necessary to be added, directly from the number of gallons of fluid in dip, and the analysis, similar to Table A, without the use of a second Table B.

J. C. BRÜNNICH, Agricultural Chemist.

Editorial Notes.

A Warning to Fruit-growers and Others.

From time to time advertisements appear in the public Press extolling the qualities of certain plants or fruits being offered for sale, usually at fancy prices, and some farmers, in consequence of these glowing accounts, are induced to make unwise purchases. Extraordinary and extravagant statements are frequently made which, from their very nature, to say the least, are gross exaggerations; yet, such is the credibility of uninformed human nature, that many people believe them and pay high prices for goods sold under attractive and misleading labels that may be purchased under their right names at a fraction of the cost of the camouflaged article. Again and again so-called novelties, more or less worthless, and which have already been thoroughly exploited, are advertised and find ready acceptance. Southern publications devoted to fruit culture have recently called attention to this phase of get-rich-quick business, and have instanced two cases. The first is that of the so-called "carringberry," which has been given an impossible pedigree, and for which fabulous yields are claimed. This wonderful plant turned out to be nothing else than the well-known loganberry, which had its known origin on the property of Judge Logan at Santa Cruz, California, and of which a specimen was growing at the University Gardens, Berkeley, California, prior to 1890. So the "carringberry" is anything but a new discovery. The other plant referred to is the so-called

"Mexican" passion fruit, which, according to Southern authorities, is none other than an overgrown variety of the common passion fruit. This fruit is known in Queensland as the "giant passion fruit," but a totally different fruit is understood when the term "Mexican" is applied here, as the fruit so designated is that of the plant known as *Tacsonia mollisima*, which is closely related to the genus passiflora, and belongs to the same natural order. It is sometimes known as the "banana passion fruit," and has been grown to a limited extent in Australia for a number of years, but practical orchardists have never seriously entered upon its cultivation. Many other instances of much over-rated fruits and plants may be cited, but these two are sufficient to stress the necessity of the continuance of caution on the part of men on the land in respect to invitations to purchase goods for which extravagant claims are made. No really genuine article requires excessive advertisement. It sells on its merits; hence growers and others interested would be well advised to accept with caution accounts of plants advertised as something not merely of superior quality but of superlatively profit-producing possibilities. Recognised Australian nurserymen are fully alive to this sort of exploitation, and are able to give reliable information respecting any much-boomed plant or fruit. It will be found that, more than likely, they have already tested it and are able to say whether it is worth growing or not.

* * * * * * * *

To Cotton-growers. As the end of this year's cotton-ginning operations is in sight, this Department cannot receive seed cotton later than 20th September. Every bag should be branded with sender's initials and a letter of advice posted as soon as the consignment has been placed on rail.

* * * * * * * *

Tractor Ploughing. The time and labour saving possibilities of tractor ploughing were demonstrated at Mr. F. A. Stimpson's dairy farm near Dutton Park on 15th August in the presence of a large gathering of farmers and others interested in agriculture. The tractor is of the caterpillar type, and has the appearance of an adaptation of the small high-speed whippet tanks which were used during the last stages of the war. It did its work in heavy soil wonderfully well, trailing two ploughs—a treble furrow and double furrow mould-board, each with rolling coulters. The condition of the field operated on was not quite favourable, being in parts wet and sticky, and the going was, consequently, very heavy. The test was therefore fairly severe, but the tractor surmounted every difficulty with ease. The work was done on second speed, something over 2 miles an hour, and the five furrows were cut each a foot wide and about 8 inches deep. An additional factor adding to the severity of the task was that the land had not hitherto been so deeply ploughed. Every one present was impressed with the efficiency and economy of the machine. Handling was reduced to a minimum. Once the engine had been cranked, the entire operation was controlled from the driver's seat, proving it to be entirely a one-man job. The tractor moved on a 13-inch "tread," and made a light impression even on soft land, and there was no evidence of its packing the soil. The demonstration generally was highly successful.

* * * * * * * *

The Cassaba Melon. The notification in the August Journal that a small quantity of seed of the cassaba melon was available for distribution at this Office brought many hundreds of applications from all parts of Queensland, and quite a number from the Southern States. The supply at our disposal was very limited, consequently the number of seeds for distribution to each applicant had to be reduced to three. A number of requests reached us after our supply had been exhausted, and in order that each may be met, efforts are being made to obtain a further supply from an outside source. So far as possible, every request will be complied with. The seeds should be sown in September in accordance with the general directions given in our last issue.

* * * * * * * *

Dehydration. The section of a dehydrator shown in full working order at the Brisbane Exhibition became the focal point of great public interest. In the course of the week of operation quantities of pines, bananas, papaws, cocoanuts, and several varieties of vegetables were successfully treated. The plant, which forms a unit of a complete 8-section dehydrator to be erected at Beerburrum in time to treat the coming season's crop, is now being transferred to that centre.

General Notes.

"THE PURE SEEDS ACT OF 1913" AS AMENDED BY "THE PURE SEEDS ACT AMENDMENT ACT OF 1914."

The abovementioned Acts, are intended to regulate the sale of seeds for planting or sowing—that is to say, all vendors of seeds must comply with the Acts and Regulations thereunder.

VENDOR.

A vendor within the meaning of the Act is—

> "Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds."

It will, therefore, be noted that the common acceptance of the Acts as referring only to seedsmen is erroneous. A produce merchant, storekeeper, auctioneer, farmer, or grower of the seed are vendors under the Acts whenever they sell, offer, expose for sale, contract or agree to sell any seeds for sowing.

INVOICE MUST BE GIVEN BY VENDOR.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

FOREIGN INGREDIENTS.

Foreign ingredients include dead and non-germinable seeds, diseased or insect-infested seeds, weed seeds, or seeds of any cultivated plant other than that to which the sample purports to belong. Also inert matter, which includes chaff, dust, stones, or any material other than seeds, and broken seeds less in size than one-half of a complete seed.

The proportion or amount of foreign ingredients that may be contained in any seeds is prescribed by the Regulations, copies of which may be obtained from the Government Printer, William street, Brisbane, for 4d. post free.

B GRADE SEEDS.

Seeds in which the amount of foreign ingredients exceeds the proportion set forth in Schedule A of the Regulations, but does not exceed the proportion set forth in Schedule B, may be sold as seeds for sowing, providing they are contained in bags or packages to each of which is affixed a label, brand, or stamp, clearly and indelibly marked, specifying: The kind or kinds of such seeds; that the seeds are B grade, for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed; the name and address of vendor. All invoices relating to such seeds must be distinctly marked "B Grade Seeds."

SAMPLES FOR EXAMINATION.

In order to ascertain if seeds comply with the Acts, samples may be submitted for examination.

The weight of such samples must not be less than the amount prescribed by the Regulations, which are as follows:—

WEIGHT OF SAMPLE TO MAIL.

Wheat, oats, barley, maize, rice, rye, peas, cowpeas, beans, tares	8 oz.
Millet, sorghum, sudan grass, panicum, buckwheat, lucerne, clover, linseed, prairie	4 oz.
Rhodes, paspalum	2 oz.
Turnip, cabbage, parsnip, carrot, and vegetable seeds of like size	½ oz.
All seeds other than those included above	2 oz.
Vegetable seeds in make-up packets	3 packets.

In the case of samples containing a large amount of foreign ingredients, it is advisable to send double the weight mentioned.

When drawing a sample care should be taken to obtain a quantity from the top, bottom, and middle of each bag. These should be thoroughly mixed to ensure the sample being uniform.

Every sample sent should have the following particulars plainly written thereon:—

Name of seed.
Quantity that the sample represents.
Name and full address of sender.

If the result of the examination is required for purposes of sale, a fee of 2s. 6d. per sample will be charged.

No charge will be made to farmers sending in samples of seed which they have purchased as seed for sowing, providing the following particulars are given:—

Vendor's name and address.
Name of seed.
Quantity purchased.
Date of delivery.
Locality where seed is to be sown.
Name and address of purchaser.

Samples, with covering letter, should be addressed to—

UNDER SECRETARY,
DEPARTMENT OF AGRICULTURE AND STOCK,
BRISBANE.

August, 1921.

PUBLICATIONS RECEIVED.

The Journal of the Ministry for Agriculture (United Kingdom) for July contains Professor R. C. Punnett's (University of Cambridge) concluding article on "Research in Animal Breeding." The tangle of sex and its dependent characters are illuminatingly set out. "One of the most striking points of difference between the higher animals and plants is that in the former the sexes are separate, while the latter are most often hermaphrodite," is the writer's opening observation, and he goes on to deal with further points of Mendelian inheritance. The whole series of articles comprise a very valuable contribution on sex heredity. Other informative contributions are: "The Dairy Shorthorn." "Grading and Packing of Fruit," "Mosaic Disease of Potatoes," "Liming," "Potato Trials, 1920," and "The 1920 Lincoln Tractor Trials."

The International Review of the Science and Practice of Agriculture (Rome) for May is made up of many valuable abstracts from the world's agricultural Press, chief among which are notes on rural hygiene, tillage and methods of cultivation, an account of how the drought problem is dealt with in Brazil, and notes on agricultural chemistry, live stock and breeding, farm engineering, rural economics, plant diseases, and entomology.

The Agricultural Gazette of Canada (May—June) has listed among its leading topics—"Fighting the Grasshopper," "Co-operative Marketing of Fruits and Vegetables in British Columbia," "Restoration of the Apple Orchard to Pre-War Productiveness," and "Prevention of Loss in the Shipment of Fruit and Vegetables."

La Revista Agricola (Mexico) for June is particularly interesting to horticulturists. It contains a fine article on rosegrowing, in addition to much other informative contributions of general interest to the tropical agriculturist.

The *Bulletin of the Department of Agriculture, Trinidad and Tobago* (Trinidad), 1921. Part 2, vol. XIX., has among its leading topics an account of sugar-cane experiments, 1918-20, by Joseph de Verteuil, F.I.C., F.C.S., Superintendent of Field Experiments, Trinidad.

The Journal of Heredity (U.S.A.), vol. XII., No. 2, February, 1921, covers a wide area in its chosen fields of plant-breeding, animal-breeding, and eugenics. Included in its original matter are articles entitled "Inheritance in Swine," "Heritable Characteristics of Maize," "Inbreeding and Cross-breeding," and "Polydactylism in Cattle."

The Journal of Dairy Science (U.S.A.) for May features the following:—"The Influence of Calcium and Phosphorus in the Feed on the Milk Yield of Dairy Cows," "Official Grading and Control of Dairy Produce for Export," and "Historical Notes on Cotton Seed as Food."

The Indian Forest Records (Calcutta), Vol. VIII., Part II., by R. S. Hole, C.I.E., F.C.H. (Botanist, Forest Research Institute, Dehra Dun), is a well-illustrated production covering an account of "The Regeneration of Sal (*Shorea robusta*) Forests—A Study in Economic Œcology," and is replete with valuable information on the results of some forestry experiments in India.

The Agricultural Journal of India (May) features among its original articles notes on "Improved Field for Agricultural Investigations," by S. Milligan, M.A., B.Sc., Agricultural Adviser to the Government of India. Other notable contributions include "Cambodia Cotton (*Gossypium hirsutum*)—Its Deterioration and Improvement," by G. R. Hilson, B.Sc.

The *International Review of Agricultural Economics* (Rome) for April has an account of the agricultural co-operative movement in Germany in 1918-19, a review of the organisation of co-operative grain elevation companies in the United States, and contains, besides, much miscellaneous information relating to co-operation in Algeria, Egypt, France, Great Britain and Ireland, and Holland, and economic and social conditions of agricultural classes in European countries.

The Rhodesia Agricultural Journal (June) covers a notable memorandum on the cattle industry in Southern Rhodesia.

The New Zealand Journal of Agriculture (July) has among its main features an article on the abortion disease of cattle, by H. A. Reid, D.V.H., F.R.C.V.S., Veterinary Laboratory, Wallaceville. Other contributions include "The Introduction into New Zealand of *Aphelinus mali*, a valuable parasite of the woolly aphis," by R. J. Tillyard, M.A., D.Sc., Entomologist and Chief of the Biological Department, Cawthron Institute of Scientific Research, Nelson; "Commercial Potato-growing" by H. E. McGowan, and "Standard Fruit Grading and Packing," by J. A. Campbell, Director of Horticulture.

The Journal of the Department of Agriculture of South Australia (July) continues an account of some feeding tests with pigs. Other informative feaures are notes on agricultural experiments and downy mildew in South Australian vineyards.

The Journal of the Department of Agriculture, Union of South Africa (July) has among its principal contents "Motor Tractors," "Spineless Cactus as a Fodder for Stock," "Pest Remedies—Insecticides and Fungicides," and "Moisture in Maize."

The Agricultural Gazette of New South Wales (August) has amongst a mass of general information a concluding article on "The Feeding of Sheep in Times of Drought," an article on "Co-operation for Farmers" (C. C. Crane, B.A.), a further contribution on "Producing Lucerne Hay under Irrigation Conditions—Methods and Experiences at Yanco Experiment Farm" (F. G. Chomley and F. Chaffey), and a report of "Some Germination Tests of Prickly-pear Seeds (E. Breakwell, B.A., B.Sc.).

OCTOBER SHOW DATES.

Toombul A.H. and I. Association: 30th September and 1st October.

Mount Larcom, *via* Gladstone: Wilmott Farmers' P. Association: 8th October.

Ravenshoe F.G. and P. Association: 12th and 13th October.

Innisfail, Johnstone River, A. Society: 14th and 15th October.

Malanda.—Millaa Millaa Settlers' P. Association: 19th and 20th October; and Eacham P.A.I. Society: 19th and 20th October.

Answers to Correspondents.

SILVER FISH (LEPISMA).

C. G. Y., Wowan—

Your application for direction as to measures for controlling Silver Fish in the house was submitted to Mr. Henry Tryon, Government Entomologist, who advises as follows:—

"These insects are very difficult to cope with, owing to the fact they have no resting period—being ones that undergo no metamorphosis, and to their obscure habits; again, since they can subsist long without food or that contained in dust and their cast skins only.

"Their most favoured aliment is starch and sugar, and glazes made of the former substance, and used for dressing silk or cotton fabrics or various forms of cardboard or papers. An incorporation of arsenic in the bodies of this nature, where its

presence is not otherwise forbidden, will both serve to protect them and kill these domestic pests.

"As a rule, exposure and thorough airing of articles amongst which they resort serves temporarily to banish them, especially if receptacles that have contained these receive at the same time a thorough brushing out.

"Pyrethrum powder (Insectibane) dusted in places that are harbours for them again serves to repel them; so also crushed "mothballs" (naphthaline). Boracic acid applied in the same manner may be useful for the purpose, too, but I have no evidence that this is so.

"Further, one can dip pieces of cardboard or strong paper in a sweetened flour-paste containing a trace of arsenic, or 'white ant cure,' and when the latter has dried upon them, place these pieces in crannies resorted to by silver fish, and so many may be destroyed. In putting linen and cotton articles away for a period, it is as well—if this be admissible—to wash whatever starch they may contain from them before doing so. This especially applies to delicate fabrics such as muslins."

PISE HOUSES.

J. RICE (Springfield, Townsville).—The Surveyor, Department of Agriculture and Stock (Mr. Arthur Morry), to whom your request for information was referred, replies as follows:—

"1. Pisé walls will resist cyclonic storms admirably. The roof would require some special attention on account of the overhang, which is primarily intended to protect the walls against wet weather. Cyclonic storms may get under the eaves, but if the projecting ceiling joints are carefully anchored down by ironbark posts, as suggested by correspondent, no harm would be likely to arise. Low or flat roofs are a good protection against cyclones.

"2. A house constructed as per plan in the situation named would have a good residential value, as it would be a permanent structure, and subject to very little depreciation, but for removal purposes its value would be limited to fittings, fixtures, and material, which could be used again.

"3. Suggest you write to Manager, State Advances Corporation, Brisbane, in connection with this question.

"4. Ant bed could be used for pisé buildings if treated properly, but it is a question not yet determined as to whether its superiority is so much in excess of normal pisé material as to justify the extra labour involved in its preparation. Formic acid is the ingredient which makes ant bed so hard. No machine of the kind mentioned by the correspondent for reducing ant bed is known, and it is questionable whether results would justify the expense. Ant bed can be worked up into a paste with water and plenty of puddling, when grinding would be unnecessary."

THE CULTIVATION OF THE DATE PALM.

JOHN MCNULTY (Thursday Island).—Your request for information on the cultivation of the date palm was submitted to the Director of Fruit Culture (Mr. Albert H. Benson, M.R.A.C.) who advises as follows:—

"This palm requires to be grown in a deep sandy soil, in a hot, dry climate. Water for irrigation must be available. The natural habitat of the date palm are the oases of Northern Africa and of the Persian Gulf, where there is great heat to ripen the fruit, and sufficient moisture in the soil to grow the palm to perfection. The only districts in Queensland in which the date is capable of being grown commercially are our dry inland regions, where there is little or *no frost* but great heat, sandy soil, and water for irrigation. The date will not stand an excess of salt; it is therefore doubtful if it would thrive on the western side of the Cape York Peninsula on the soils mentioned, even though the climate were favourable."

PINEAPPLE FERTILISER.

A. McC. (Lissonagh, Kuraby).—Superphosphate must on no account be used for pineapples. A formula approved by Mr. A. H. Benson, Director of Fruit Culture, and which is producing very good results at Beerburrum, is—

Dried blood	400 lb.
Sulphate of potash	200 lb.
Holborne Island phosphates	150 lb.
Total	750 lb.

TO EXTIRPATE SCOTCH THISTLE (CARDUUS LANCEOLATA).

A.G.N. (Scrubby Creek, Howard).—If infestation is heavy, we would suggest mowing before the thistles reach maturity, and stacking for ensilage. When so conserved they possess valuable nutritive qualities, Spraying with poison is expensive and highly dangerous to stock, particularly horses, which at certain periods of growth are very fond of Scotch thistles. Where paddocks are entirely overrun with thistles they become in time "thistle sick." Instances of this are frequent, and paddocks almost impassable from this cause become, as a consequence, entirely free.

MIXED FARMING.

"CLOUGH EAST" (Murgon).—Recommend concentration of energies on improvement of stock, and conservation of fodder in the form of ensilage and so on. Rotation crops you will find will be better paying propositions in your district, as adjuncts to dairying, than from a cereal-production point of view. We are in this instance referring to wheat, oats, and barley being used in rotation with lucerne. Maize, of course, is another matter, and can be grown as a commercial side line. This Department will be pleased to co-operate with you in experimental work in grain, sorghum, and other crops, and you are advised to get in touch with the Director of Agriculture, intimating your willingness to take up this class of work, for which you will be compensated.

Stock at State Farms for disposal:—State Farm, Warren—Ayrshire cattle and Berkshire pigs. Queensland Agricultural College, Gatton.—*Cattle*—Ayrshires, Guernseys, Jerseys, Friesians. *Horses*—Clydesdales. *Pigs*—Berks and Yorks. Kairi State Farm.—*Cattle*—Illawarra, M.S., Jerseys. *Pigs*—Berks. Gindie State Farm.—*Cattle*—Beef Shorthorns. *Horses*—Suffolk Punch.

FOR POISONING TREES.

A.H.K. (Wilsonton, Toowoomba).—Formula—

Arsenic	1 lb.
Caustic soda	2 lb.
or	
Washing soda	3 lb.
Water	4 gals.
Whiting	½ lb.

Method.—Mix the arsenic into a paste with water. By diluting a little and mixing with caustic soda great heat is generated, and the arsenic becomes dissolved. Additional water should be added to make up the required 4 gallons. When using washing soda, proceed as before, and add gradually to soda solution, boiling for at least an hour until arsenic is dissolved. Keep the whole solution well stirred. The arsenical fumes being dangerous, care must be taken to avoid inhalation during the boiling process. The whiting is used for the purpose of showing up by means of its colour areas treated. This poison should be poured into a frill cut into the bark and encircling the tree.

CATERPILLARS IN LUCERNE.

In lucerne affected by the larvæ, cut the crop, when most of the cocoons are formed (this is indicated by the leaves curling) and stack either in the form of ensilage or allow it to reach the stage when it will make sweated hay. The temperature so caused is sufficient to kill the grub, and the value of the hay as fodder is not detrimentally affected. As soon as the crop is removed, the paddock should be well rolled and cross rolled. Harrowing during frosty weather would be beneficial, having a tendency to bring to the surface and expose any larvæ that may be perdu.

PIT SILOS.

E.A.T. (Humberton, Roma).—It is not advisable to slope the sides of a pit silo, as in so doing the settlement of the material pitted is necessarily impeded. The less friction set up in the process of settlement the less air will be admitted, and consequently better ensilage will result, fermentation thereby being prevented. Under any circumstances the sides of all pit silos should be lined with wood, brick, or concrete (preferably the last), and the pit made impervious to water.

MOTOR PLOUGHS.

H.T.M. (Burnham Farm, Woombye).—Several makes of the class of motor plough to which you refer have lately appeared on the American market, but no further particulars have been received of the plough referred to.

The Markets.

THE FRUIT TRADE.

Returns of Exports and Imports for the month of July, 1921, for Brisbane only:—

EXPORTS BY RAIL, VIA WALLANGARRA, TO SYDNEY AND MELBOURNE.

TO SYDNEY—

10,773 cases bananas
47 cases oranges
8,083 cases pineapples
606 packages vegetables
517 cases mixed fruits
1,718 trays strawberries

TO MELBOURNE—

28,353 cases bananas
1,006 cases oranges
7,278 cases pineapples
124 cases mixed fruit

EXPORTS BY SEA.

TO SYDNEY—

749 cases bananas
5,877 cases pineapples
329 bags sweet potatoes
350 bags pumpkins
260 cases fruit pulp
4,049 cases canned pineapples
1,213 bags barley
950 bags vegetables

TO MELBOURNE—

926 cases bananas
3,503 cases pineapples
638 cases oranges
70 cases vegetables
88 cases mixed fruits

IMPORTS.

BY SEA—

25,582 cases fruit
8,012 bags potatoes
4,718 bags onions
110 packages plants

BY RAIL—

6,773 cases of fruit
5,993 bags potatoes
217 packages plants

PRODUCTION, PROSPECTS, AND PRICES.

The following market survey is an abridgment of departmental summaries of conditions, prospects, and prices for the month ended 20th August, 1921:—

AGRICULTURE.

The heavy July rains were in many places followed by floods, more or less serious. A period of low temperatures accompanied by heavy westerlies ensued. Frosts were badly needed, particularly in the fruit and wheat areas.

THE MARKETS.

Lucerne Chaff.—Commencing with a poor demand, conditions improved as the first week of the period under review advanced. Sales were effected from 6s. to 8s. 6d., but many lines were passed in at 6s. 3d. to 6s. 6d.

Oaten Chaff.—A fair demand existed for lines from over the Border, but local lines were lifeless. Border supplies sold to 8s. 9d. for prime. Sales of local chaff ranged from 3s. 7d. to 5s.

Mixed Chaff.—Supplies fairly plentiful, but demand weak. Sales were made at 3s., 5s. 4d., 6s. 7d., and 7s. per cwt., whilst many lines were passed in at 4s. 6d., 5s., and 6s. per cwt

Maize.—Supplies were light at the beginning of the first week, but increased later; 4s. 3d. to 4s. 5d. was the range, but many consignments were passed in at 4s. 4d. to 4s. 4½d.

Wheat.—Good feed lines sold to 7s., with inferior grain down to 4s. 3d.

Potatoes.—The demand for good tubers improved, and sales were made at 5s. 9d. to 8s. 3d. per cwt. Many parcels were withheld, business being refused at 4s. 6d. to 6s. 9d.

Sweet Potatoes.—Very few lots came forward. Prime quitted at 3s. 2d. per cwt., and inferior changed hands at 2s. 6d.

Pumpkins.—Demand light. Sales were made at 2s. 3d. to 2s. 9d. Many lines were passed in at 2s., 2s. 3d., and 2s. 6d. per cwt.

Barley.—Only one line was submitted and passed in at 3s.

Broom Millet.—Unchanged. Prime hurl brought £28. Other qualities down to £21 per ton.

In the middle of August the weather was unseasonable, bleak winds being followed by heavy frosts, causing some damage. This, however, was balanced by a check to insect life. Wheat prospects were good. Generally speaking, the agricultural and pastoral outlook in Queensland for the next few months at least is distinctly favourable. Supplies of all classes decreased, and prices rose a little as the result of a dearth of prime lines.

MID-MONTH PRICES.

Lucerne Chaff.—Supplies fair, quality a little inferior. The top price was 7s. 11d.; other lines quitted at from 4s. 6d.

Mixed Chaff.—Dull; 4s. 6d. to 6s. 9d.

Oaten Chaff.—Plentiful; demand fair; 3s. to 8s. 9d.

Maize.—Keen competition ruled for prime lines, which were scarce; 4s. 5½d. top price.

Potatoes.—Supplies lighter; improved prices; 6s. to 9s. 4d.

Sweet Potatoes sold at 2s. 9d. to 3s.

Wheat market not overstocked, most lines selling at 3s. 6d. to 6s. 1d.

Malting Barley.—One line passed in at 3s. 3d.

Pumpkins.—Good sales to 2s. 9d. A few parcels realised 3s. 4d.

Broom Millet fetched from £22 to £28 for prime hurl.

Occasional showers followed by cloudless skies marked the last week of the term. Frosts were fairly general. The rain-benefited areas included Northern, Central, coastal districts, and Darling Downs. Lucerne crops were well advanced, and a continuance of fine weather to favour harvesting was looked for. Wheat and other crops were making good growth, and the outlook generally was extremely promising. Increased marketings of all classes of produce were a feature of Roma Street. Prices were good for prime lines. For the week ended 20th August the figures were:—

Lucerne Chaff.—Fairly plentiful, a slight decrease in values; 3s. 9d. to 6s. 7d.

Oaten Chaff.—Border lines again in good demand; 5s. 6d. to 8s. 3d. Local, 5s., 5s. 6d., 6s. 3d.

Mixed Chaff.—3s. 9d. to 6s. 7d.

Wheat.—4s. 9d. to 6s. Demand slackened.

Potatoes.—Supplies increased at the end of the week, and competition, although keen at the commencement, eased off considerably. The bulk of supplies withheld at offers of 5s. 6d. to 8s. 10d. Lines sold realised from 5s. 3d. to 9s. 9d.

Sweet Potatoes.—2s. to 3s. 10d.

Pumpkins.—Demand firm; 2s. 3d. to 4s.

Maize.—Supplies heavy; prices on the up grade; 4s. 6½d. was the best sale; others from 4s. 2½d.

Broom Millet.—Prime £28, inferior down to £20.

DAIRYING.

Statistics for the dairy industry for four weeks ended 20th August include the following:—

Production.—Quantity submitted for examination for cold storage:—Butter, 40,885 boxes (each 56 lb.); cheese, 4,487 crates (each 142 lb.).

This production may be viewed as over and above local requirements and available for export.

Shipments Interstate.—Butter, 11,174 boxes; cheese, 1,024 crates.

Shipments Oversea.—Butter, 30,009 boxes; tinned butter, 109 cases; cheese, 67 crates; luncheon cheese, 4 cases.

In Cold Storage on 20th August, 1921.—Butter, 23,268 boxes (approx.); cheese, 2,669 crates (approx.).

FRUIT.

Weather conditions improved in the course of the first week of the period. The welcome dry change proved beneficial to the coming crops. Spring planting preparations were also facilitated, and a further dry spell will make for good burns in the scrub areas. Pruning and winter cultivation were the main activities in orchards and vineyards. Quantities of citrus fruits, bananas, and pineapples were coming on to the market, all of generally good quality. The demand was fair, but prices were lower than those ruling at the corresponding period of last year.

In the second week of the term fine dry days, with cold strong westerlies, had the effect of drying saturated surfaces and allowing growers of temperate fruits to proceed with spraying and pruning. Fresh planting areas were also in course of preparation in many localities. Pineapples, citrus fruits, bananas, strawberries, papaws, and cape gooseberries made up the full range of offerings. A limited number of pines were packed, and the finished product is of high quality.

Show week was remarkable for almost perfect weather. Light frosts caused some damage in exposed situations. At the Show was seen one of the finest displays of citrus varieties and other seasonable fruits ever assembled in Queensland. The Southern Queensland Fruitgrowers' Society, Limited, which represents no fewer than sixty-two individual associations, had a magnificent exhibit. The Returned Soldiers and Sailors Co-operative Fruitgrowers' Association, whose headquarters are at Woombye, also displayed a very fine trophy.

In the course of the week ended 20th August rising temperatures betokened an early spring. On the coast, vines had started growth, and vignerons had commenced spraying to prevent mildew and black spot. The preparation of country for pineapples and bananas was proceeding satisfactorily, and on the scrub areas early burns were anticipated. Very heavy crops of strawberries were coming on to the market. Berries of exceptional quality were the rule. The question of the disposal of strawberry pulp is now under consideration and, should a trial shipment be made with satisfactory results, another important step towards payable treatment of glut crops will have been taken. Bananas and pines are still coming forward in quantity and good quality. Pines are still (at the date of writing) being treated at the State and other canneries, and the quality of the output is high. The present pack is regarded as the best so far put up in the State, and that it is even better than last summer's canning.

FAT STOCK.

REPORT FOR WEEK ENDED 20TH AUGUST.

Cattle.—1,040 yarded. The general quality of the yarding was below average. Only a few lines of trade bullocks up to standard were offered. Cows made up a good proportion of the yarding, and sold well. The market generally was better than that of the previous week, and the closing sales were decidedly firmer. Best bullock beef quitted at from 24s. to 28s., good bullocks 21s. to 23s. 6d., and cows 20s.

Sheep.—About 8,400 sheep were penned, including several trainloads from the Central and Western districts. The quality was mixed, and a good number of stores were included in the offerings. All round, the market was about equal to that of the previous week, prime sheep selling to 3½d. per lb., and good trade mutton to 3d. per lb.

Orchard Notes for October.

THE COAST DISTRICTS.

October is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised, as, unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied with same. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of these spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitious plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such diseases as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season, the subsequent crops of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of "The Coast Districts" applies equally to these parts of the State, as on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruits are grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful watch should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruits, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil

spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm and Garden Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, sorghum, setaria, imphee, panicum, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants, from preparing the ground to harvesting the crop, to which our readers are referred.

KITCHEN GARDEN.—Our notes for this month will not vary much from those for September. Sowings may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 ft. apart with 18 in. between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomato plants planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. See our instructions in "Market Gardening," obtainable on application to the Under Secretary, Department of Agriculture and Stock. Rosella seeds may be sown this month. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

FLOWER GARDEN.—The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant tuberose, crinum, ismene, amaryllis, pancratium, hermocallis, hippeastrum, dahlias, &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphis, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6 8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5 36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5 54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6 13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	3·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5 40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5 58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6 22	4·51	6·42
24	5·37	5·44	5·5	6 0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6 25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6 26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

		H.	M.
2 Sept.	New Moon	1	33 p.m.
9 „	First Quarter	1	30 p.m.
17 „	Full Moon	5	20 p.m.
25 „	Last Quarter	7	18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·18 p.m.

1 Oct.	New Moon	10	26 p.m.
9 „	First Quarter	6	12 a.m.
17 „	Full Moon	9	0 a.m.
24 „	Last Quarter	2	32 p.m.
31 „	New Moon	9	39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	First Quarter	1	54 a.m.
15 „	Full Moon	11	39 p.m.
22 „	Last Quarter	9	41 p.m.
29 „	New Moon	11	26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	First Quarter	11	20 p.m.
15 „	Full Moon	12	50 p.m.
22 „	Last Quarter	5	54 a.m.
29 „	New Moon	3	39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

COTTON SEED AS STOCK FOOD.

BY J. C. BRÜNNICH.

In the August number of this Journal the Principal of the Queensland Agricultural College dealt with the economic aspect of the utilisation of cotton seed as a food for cattle, and the importance of such utilisation becomes very apparent when we consider that for each pound of cotton fibre or lint produced there are at least 2 lb. of seed.

In the July number appeared a short notice on "Cotton Seed for Sale," and an analysis of cotton seed meal was given, which is the analysis of a very choice decorticated cotton-seed meal, and was followed by the remark that cotton seed after reduction to the form of meal is richer than cotton-seed meal. This statement is not correct and, as a matter of fact, ground cotton seed will have less than half the feeding value.

Ground cotton seed should unquestionably be utilised as cattle food and, if used with discretion, will give good results. Therefore, such use is quite justified until larger quantities of seed are produced, which would make the proper treatment of the seed practicable. The only correct method for the utilisation of cotton seed as food is after decortication and extraction of the oil, on account of the great value of the oil and the well-established fact that cotton-seed meal gives far better results as a cattle food than ground cotton seed.

Henry and Morrison, in their standard work, "Feeds and Feeding," state:—

"The practice of feeding cotton seed to beef cattle in the South is rapidly declining, according to Soule, of the Georgia Station, both because of the demand for the seed for oil production and because cotton-seed meal gives uniformly better results than the whole seed."

In a feeding trial at the Texas Station it was found that 4 lb. of cotton seed substituted for 1.9 lb. of cotton-seed meal produced smaller gain of live weight, and that cotton-seed meal at 26 dollars per ton was cheaper than cotton seed at 12 dollars.

The hard, leathery shells, or hulls, of the cotton seed have practically no feeding value, and are passed by the animals in undigested form. Even when ground very fine the digestibility of the hulls is but little increased, and ground hulls have less

feeding value than straw or corn stover. In many cases the accumulation of a compact mass of undigested hulls in the bowels has caused serious troubles and death. The first observation on so-called cotton-cake poisoning, following the used of undecorticated cotton cake, was made by A. Voelcker, in 1859, and reported in the "Veterinarian." The post-mortem examination of the animal showed the duodenum blocked by 72 lb. of comminuted and densely impacted hulls.

The occasional fatalities caused by such balling or impaction of the hulls do not, however, explain the numerous cases of ill-effects reported from time to time, but show distinctly the necessity of removing a large portion of the hulls from the crushed seed, and the advantages of using decorticated meal. But even decorticated cotton-seed meal cannot always be safely used, and the mere fact that nobody recommends its use for young calves, lambs, swine, and cows heavy in calf, shows that discretion is always necessary when using this highly concentrated food.

Henry and Morrison (*ibid.*) state:—

> "Numerous efforts have been made during the past twenty years to determined the cause of the poisonous effects of cotton-seed meal. The harm has been variously ascribed to the lint, the oil, the high protein content, to a poisonous albumin or alkaloid, to choline and betaine, to resin present in the meal, to decomposition products, and to salts of pyrophosphoric acid. Further work shows that the poisonous effects are not due to any of these causes."

It may be safely assumed, however, that the proteins in the cotton-seed meal, present in such large amounts, when fed to young animals, or animals already suffering from slight digestive troubles, or when being mixed with other unsuitable fodder, are not readily and properly peptonized by the digestive fluids, but micro-organisms gain the upper hand and form poisonous ptomains. It is well known that choline and betaine, in itself very slightly poisonous, are always found in cotton-seed meal, and that the former changes readily into the much more poisonous neurine.

A very complete summary of the many theories advanced up to the present time by many investigators on the probable causes of injuries due to cotton-seed meal is given by Icie J. Macy in "Historical Notes on Cotton Seed as Food" ("Journal of Dairy Science," May, 1921):—

> "In 1915 two theories arose:—Firstly, that cotton-seed meal poisoning is a deficiency disease, as set forth by Rommel and Vedder (1915) and later supported by Wells and Ewing (1916); secondly, that it is due to a definite phenolic compound (gossypol) found in cotton-seed meal as shown by Withers and Carruth (1915).
>
> "The results of investigators in their studies of cotton-seed foods are not constant, owing in part to the notable variations in effects upon live stock. Even animals of the same species respond at different times with unlike symptoms, although they consume similar quantities of the same food. Other difficulties are encountered. The degree of toxicity of cotton seed depends on the variety of seed and upon the climate and soil in which they are grown. And again, the meal made from the kernels is greatly altered by the treatment in the process of manufacture. There is uncertainty as to the degree of the responsibility of gossypol for the toxicity, as results of investigators differ. All such factors lend difficulty to the study of the effects of cotton-seed foods and render the present status of the problem uncertain."

All these remarks point to the fact that one must be cautious when feeding stock with cotton seed or its products. Fresh, well-cleaned decorticated meal is unquestionably an excellent, highly nutritious food for cattle, but should not be given in quantities exceeding 4 lb. per head of 1,000 lb. live weight. Young calves, lambs, pigs, and cows within four weeks of calving should not get any cotton-seed meal.

In order to ascertain the actual food value of our Queensland-grown cotton seed, samples were obtained from our departmental store, and short lint, hulls, and kernels were carefully separated and analysed.

The actual amounts obtained agree very closely with the yields obtained elsewhere.

According to Burkett and Poe, 1 ton of cotton seed yields—

Linters or short fibre ..	27 lb. or 1.4 per cent.	43.4 per cent.
Hulls	841 lb. or 42.0 per cent	
Cake or meal	732 lb. or 36.6 per cent.	
Crude oil	280 lb. or 14.0 per cent.	
Loss, &c.	120 lb. or 6.0 per cent.	
	2,000 lb. or 100.0 per cent.	

We actually obtained from our own seed 10.5 per cent. of short lint, 31.3 per cent. of hull, or 41.8 per cent. lint and hull, and 58.2 per cent. kernel.

At the same time a larger quantity of seed was treated by one of our local firms, and, after crushing the seed, as much as possible of the hulls was sifted out. From 2 tons of seed about 1 ton of meal was obtained, but as the cost of treatment, crushing, and sieving amounts to £2 per ton, the cost of this meal would be £9 per ton if the seed is £3 10s. a ton.

The analysis of this meal is given below, and I believe that in this form the bulk of our cotton seed should be utilised at present as cattle food, until larger quantities of seeds produced would warrant the establishment of an oil-extracting plant, as by the extraction of the oil the protein percentage of the meal is considerably increased.

ANALYSIS OF:

	Lint.	Shell.	Kernel.	Whole Seed.	Sifted Whole Seed Meal.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	7·83	12·10	7·15	8·8	7·59
Crude protein	2·50	3·06	36·44	22·4	34·00
Crude fat	0·61	0·37	29·11	17 1	28·22
Nitr. free extract	14·65	60·03	18·27	31·0	14·95
Crude fibre	72·50	21·11	4·03	16·6	9·24
Crude ash	1·91	3·33	5·00	4·1	6·00

In order to ascertain the actual unit value of the food and to compare it with other commercial concentrated foods, in the same manner as it was done for calf foods ("Queensland Agricultural Journal," March, 1919), the total number of food units is ascertained by multiplying percentages of digestible proteins and fat by 2½, and adding the percentage of other digestible carbohydrates, or nitrogen-free extract, and digestible fibre. These units divided into the price per ton gives the price per unit:—

COST OF FOODS.

	DIGESTIBLE NUTRIENTS.				Food Units.	Cost per ton.	Cost per Unit.
	Protein.	Fat.	Carbohydrates or Nitr. free Ext.	Fibre.			
	%	%	%	%	%	£ s. d.	s. d.
Cotton seed	15·2	14·9	15·5	12·6	103·4	3 10 0	0 9
Sifted Cotton seed meal	23·1	24·5	7·5	7·0	133·6	9 0 0	1 4
Primo decortated Cotton-seed meal	37·0	8·6	21·8		135·8	..	..
Linseed meal	19·9	10·4	27·6	5·5	108·8	16 0 0	2 11
Sunlight Oilcake	12·9	8·4	36·3	7·3	96·7	15 0 0	3 1
Maizemeal	7·4	3·0	62·8	3·0	91·8	15 0 0	3 3
Bran	11·4	3·8	41·6	2·2	81·8	8 10 0	2 0
Pollard	12·4	4·2	46·0	2·0	89·5	8 10 0	1 11

The table clearly shows that cotton seed is the cheapest concentrated food obtainable at present, more particularly in comparison with linseed meal and oilcake which, only two years ago, were some of our cheapest concentrated foods, but have since enormously increased in cost. Pollard is still a reasonably cheap concentrate. Some of the prices are hard to explain. Why should maizemeal be £15 per ton, when maize costs only about £9?

Although feed is plentiful just now, farmers are strongly advised to secure their share of the cotton seed to supplement the ration of their dairy stock with reasonable amounts of this highly nutritious food. The increased yield and better quality of the milk will return a good profit for the extra outlay, and show the value of systematic feeding of all stock.

WINTER FEEDS ON THE ATHERTON TABLELAND.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, has received the following report (dated 10th September, 1921) from Field Assistant F. J. S. Wise on winter green feed trials at Mr. Robert Campbell's farm, Peeramon:—

"Though the wet season had provided sufficient natural feed for most dairymen's requirements, the full benefit of a winter crop, even sown early, would, by subdivision of paddocks, be felt in any year. The profits would be immediate, showing in the increased cream returns, and the cattle would be kept in a state of health and vigour, conducive to heavy production. An area of a few acres of well-planned crops would be sufficient to tide most tableland dairymen over the lean months.

"The whole of this crop could have been converted into valuable hay if harvested late in July, as fine weather prevailed for the purpose, but it is feared, now that drizzly weather has started, that portion of the crop may be spoiled. As a hay proposition, the southern portion of the tableland is uncertain, but the crops included in the trial, on the farm of Mr. Campbell, as green fodder leave little to be desired. As our last year's trials at Tarzali were the means of many small areas being planted, it is to be hoped that the activities of the Department will be again marked by the increase of many winter fodder areas in the dairying districts.

"As the later trials have only recently been planted, some months must elapse before other results become available.

"NEW SCRUB LAND UNDER GRASS FOR SEVERAL YEARS.

"*Ploughed early in April. Sown 22nd April*, 1921. *Yields taken 3rd August*, 1921. *Area*, 3 *acres.*

"*Plot* 1—*Blue Field Peas.*—This old standard pea was very encouraging in growth throughout, and produced a solid mass of fodder. Yield green stuff (pods well set), 8 tons per acre.

"*Plot* 2—*Grey Field Peas.*—As was the case with this variety in trial last year, the growth was excellent; in fact, it is doubtful whether field peas ever grew better. Personally, I have not seen anything to come near them. The very heavy growth of succulent fodder would be sufficient inducement for all farmers in the dairying districts to supplement their supplies with this excellent legume. Though broadcasted at the rate of 25 lb. per acre, the vines completely covered the ground, and specimens have been secured over 8 ft. in length. The yield was equal to 15 tons per acre in a medium portion of the crop, and much heavier in places.

"*Plot* 3—*Golden Vetches.*—After the experiment with this crop last season it will be remembered that I was strong in the praise of it (refer to report dated 14th September, 1920). This season, when sown alone at the rate of 30 lb. per acre, the crop made one dense mass on the ground, and though yielding well, owing to its creeping habit, requires a strong cereal to support it. A crop worthy of more attention than is at present given. Yield, 8 tons per acre.

"*Plot* 4—*Golden Vetches combined with Bunge Wheat.*—This combination is undoubtedly an excellent one. The wheat was sown at the rate of ½ bushel to the acre, but it would be an advantage to increase this quantity. The vetches doubtless increase the value of the basic crop, and even if fed off would do much to assist the dairymen in keeping up supplies and improving their soil. The yield was high, and samples of the vetches grew 4 ft. up the cereal. Yield, 14½ tons.

"*Plot* 5—*Bunge Wheat.*—Excellent growth was maintained throughout by this variety and, in spite of the heavy wet, showed little sign of rust. As a green fodder it deserves a lot of attention in this district. Yield, 8 tons per acre. Flag very heavy.

"*Plot* 6—*Amby Wheat.*—Though not yielding the quantity in bulk of green stuff when compared with Bunge, this variety has many admirable features and may, possibly in the wetter areas, be a surer crop. Yield, 6½ tons.

"*Plot* 7—*Warren Wheat.*—As was anticipated, this variety would prove a top-notcher as a wheat for green fodder in our dairying centres. At about two and a-half months a wonderful bulk of green feed was in evidence, and up to earing stage the flag was almost unaffected by rust. It would be a risky crop for hay, as the heavy growth of the plant would not be sustained as moisture began to peter out. It should do well grazed off at about two months and then allowed to grow for a final yield of green fodder. Yield, 9½ tons.

"*Plot* 8—*Florence Wheat.*—This good old variety would be a more certain crop on the tableland than perhaps any other wheat, but in a wet season, as the one in which this test has been conducted, the value of the later wheats and their heavy growth is very marked. In a dry season, however, the tables would be turned, and where Florence would be a 'certain something,' a variety such as Warren may be a dead loss. Owing to its being very mature, this variety weighed light at time of tests for green fodder weight, yielding 5½ tons.

"The time of harvest was very opportune for wheat varieties Bunge and Warren to weigh well, the latter especially was at its heaviest stage, just breaking into ear, whereas Florence was almost ripening off. The combination of wheat and vetches has again proved to be one of the most valuable farmers could produce on the tableland, as a great mass of succulent fodder resulted. The wheats were sown at the rate of 1 bushel per acre, and in most tableland soils, especially with a sparse stooler as Florence, could be increased 50 per cent. with advantage. The rain during the growing period was 18 in., which is heavier than usual, but an average of the last six years for the period this crop occupied the land is 10.25 in., so that this year's results could be proportionately obtained in almost any year.

"The big argument for the success of these trials at Peeramon rests on the fact that a heavy crop of maize was cut for silage in March, the land being afterwards immediately ploughed for the reception of the seed for the second crop."

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

By H. I. JENSEN, D.Sc. (Syd.).

I.

INTRODUCTION.

It has been known for ages that many forest trees have a special predilection for certain kinds of soil, and as the science of geology has developed it has been noticed by field geologists in all parts of the world that certain trees are almost entirely confined to certain geological formations. So definite is the dependence of some plant species on a particular rock type that these plants can be used in field mapping as safe indications as to the formation beneath the soil on which they grow.

The study of forests in relation to soils and geological formations has attained high scientific development in countries like France and Denmark, where reafforestation is a matter of great national importance. The relation between forest trees and geological formations here in Australia has been repeatedly referred to and discussed in scientific writings and reports by J. H. Maiden, F.R.S. (Government Botanist of N.S.W.), and R. H. Cambage (now Under Secretary for Mines, N.S.W.), E. C. Andrews, B.A. (Chief Geologist, N.S.W.), and the writer as well as many others.

The writer is not a botanist, but he has endeavoured to get a working knowledge of the timbers of every area he has investigated as geologist or soil surveyor in the Northern Territory, Queensland, and New South Wales, by collecting botanical specimens and having them diagnosed by men like Mr. J. H. Maiden or Mr. C. T. White, who are specialists in the science of botany.

The writer has outlined the relationship of soils to the underlying geological formations and also the principles which govern the dependence of forest flora on geological formation, in a series of articles in the "N.S.W. Agricultural Gazette," during the years 1908-1912, when he was carrying out soil survey work in New South Wales. These investigations were published in text-book form by the Agricultural Department of New South Wales in "Soils of New South Wales" (Government Printer, Sydney. Price, 5s.).

A brief summary of the conclusions arrived at by extensive surveys, accompanied by thousands of soil analyses, in New South Wales, is desirable at the outset of this series of articles.

It was found that the character and quality of soils were dependent principally on geological formation, secondarily upon climate and topography. Topography is, however, as a rule itself dependent on geological formation and climate, and is therefore a factor of minor importance as compared with geology and climate.

Thus in coastal regions and inland regions alike, soils can be divided into geological groups which stand in the same relation to one another, as for instance—

Granite Sandstone Quartz schist	Sandy light loams relatively poor in mineral plant-food.
Trachyte Andesite Shale	Loams, fair in plant-food.
Diorite Basalt Calcareous sandstone Calcareous shale Limestone	Clayey soils rich in plant-food.

But, although coastal basalt or limestone soil type is very high in plant-food as compared with a coastal sandstone or granite soil type, a typical inland sandstone soil may carry more soluble plant-food than the coastal typical basalt soil, without the relative order of richness in plant-food for the various groups being interfered with. This is due to the leaching which coastal soils (wetter climate soils) undergo as compared with inland soils.

Just as chemical plant-food in a soil depends on geological formation so does soil texture, and climate affects soil texture as well. However, a clayey basalt soil in a wet climate is very good agricultural country, while in a dry climate it is not infrequently unsuited for cultivation on account of its stiffness and alkalinity. It is therefore apparent that soil analysis is not by any means a reliable guide to the agricultural value of a soil. Many a soil which gives an analysis very poor in mineral plant-food contents is a soil of high fertility, owing to the underlying geological formation by its gradual disintegration supplying the plant-food ingredients as speedily as the plants can use them. The poverty of the soil under analysis is, in such cases, due to its being a leached soil. For instance, the granite soils on the hill slopes around Stanthorpe seem, on analysis, to be very poor in plant-food. They are deficient in lime, potash, and phosphate, at least in an available form. Yet that country has in many places supported orchards for over thirty years without any manure being given, and it is safe to say that in some cases more potash—many times more potash—has been removed from the ground in fruit, seeds of fruit, and prunings than the soil showed to be present when analysed. Where did this surplus potash come from? It came out of the decomposing minerals of the underlying granite. As fast as these soluble plant-foods get out of the granite minerals into the soil water they are either made use of by plants or leached away. We can also fix them in the soil by increasing the quantity of humus in the soil, for humic acids combine with the mineral substances, forming less soluble compounds.

Hence, where we have a geological formation which, like dioritic granite, liberates much potash, lime, and phosphate, in its decomposition overlain by a leached hungry soil, we can improve that soil in potash, lime, and phosphate without adding any of these substances but simply by increasing the amount of humus in the soil with catch crops, &c. But when the formation below the sandy leached soil is silicious granite or sandstone, very little mineral plant-food gets liberated through rock disintegration, and these substances must be added in the form of artificial manure.

When this is fully comprehended, it is easily seen how deceiving soil analyses are when the geological formation and conditions of occurrence of the soil are not known to the analyst.

It therefore follows that a geological examination of an area is a better guide to the farmer than soil analyses unaccompanied by field inspection, so long as the geologist understands the principles of soil chemistry.

When the writer commenced his researches on soils he was hopefully working under the delusion that soil analysis by itself could be made the basis of soil classification. Little by little the hope was shattered, although various methods of analysis, such as the hydrochloric, the citric, and the water soluble methods were tried.

The researches, however, did establish the fact that the bushman's method of judging soil by the timber growing on it was thoroughly sound in principle.

It therefore follows that notes made on soils and the timbers growing on them may be very useful to intending agriculturists, and are consequently offered for what they are worth. It may be stated that the determination of the plants has been made by Mr. C. T. White, Government Botanist of Queensland, to whom the writer owes his sincerest thanks.

It will be best to consider the subject under discussion geographically under the headings—

1. Roma to Injune.
2. The Maranoa Valley.
3. The head of the Warrego.
4. The tributaries of the Nogoa.
5. The tributaries of the Brown.
6. Westgrove and Glenhaughton, Taroom.
7. The Drummond Range.
8. Tables of vegetation.

ROMA TO INJUNE.

The soils are predominantly good in chemical plant-food constituents and somewhat variable in texture. However, there are belts of rather poor sandy soil at intervals, corresponding to outcrops of white sandstone, but these do not constitute any large area.

The country traversed can be divided into—

(*a*) Open plains.
(*b*) Brigalow scrub and brigalow-belar scrub.
(*c*) Belar-wilga scrub.
(*d*) Sandalwood country.
(*e*) Box country.
(*f*) Ironbark country.
(*g*) Pine country.
(*h*) Moreton Bay ash and sugar-gum country.
(*i*) Basaltic box lands.
(*j*) Gilgai country.

Open Plains.—Treeless plains invariably occur on heavy black soil of a highly calcareous nature. It is sometimes of basaltic nature, as on the Darling Downs, but more often of limestone or calcareous shale derivation in the area under review. Such black soils usually expand enormously on wetting, and this feature is by many considered responsible for the absence of trees on them. It is argued that formation of huge cracks in dry weather, the hummocking up of the soil by expansion in wet weather, interfere so much with the roots of trees that tree growth cannot take place.

However, a more likely cause of the open plain is the presence in the soil of alkali or other soluble salts detrimental to the germination of seeds of forest trees. It is known that brigalow frequently supersedes open plain, and that where a brigalow thicket dies out we sometimes get a plain. Brigalow can stand more alkali than other plants, and therefore casts some light on the problem.

An efflorescence of "white alkali" (sulphate of soda) is often met with in pockets on these plains, and over some areas gypsum (sulphate of lime) is exceedingly plentiful in the soil. The white alkali is more often seen on the basalt plains and the gypsum on the rolling downs or cretaceous marine limestone. White alkali and gypsum are very different substances, but either can be present in such excess as to hinder germination. This accounts for the fact that a very heavy rain, which thoroughly leaches all the soluble salts out of the ground, is necessary to germinate the grass seeds on the black soil plain.

The stiffness of black soil plain is due mainly to "black alkali" (carbonate of soda) which is not only detrimental to the texture of the soil but is also a plant poison. This may be present to the extent of .05 per cent., and the problem of cultivating black soil plain hinges on the difficulty of destroying this salt cheaply and effectively. Mr. Symmonds's scheme of applying nitric acid would be very good if nitric acid were cheap enough. In chemical plant-foods the black soils are very rich, as may be gauged from the following anaylses by the hydrochloric acid method:—

	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
	%	%	%	%	%	%
Namoi, N.S.W., black soil (average) ..	5·45	6 36	·099	·680	·390	·201
Castlereagh River, N.S.W. (average) ..	4·82	7·95	·110	·476	·264	·154
Moree, N.S.W. (average)	7·04	5·83	·066	·714	·286	·092

These soils are, roughly, seven times as rich in mineral plant-food as fairly good sandstone soils.

When a hill occurs in black-soil plain country, we find the black soil passing into chocolate loam on the slope, and here we get a sprinkling of forest trees. The soil of such hills is not nearly so rich in plant-food, being more leached, but, owing to the carbonate of soda being leached out first, it is more fertile.

The trees on the fringe of blacksoil plains are brigalow (*Acacia harpophylla*), emu apple (*Owenia acidula*), box (*Eucalyptus populifolia*), sandalwood (*Eremophila Mitchelli*).

Open plains are characteristic of the calcareous shales and limestones of the cretaceous (rolling downs), but occur also in patches in the brigalow belt of the Lower Walloon calcareous shales at Injune Creek and Mount Hutton.

Brigalow Scrubs.—These occur on the same or a very similar soil type as the open plains, namely—heavy, black, clay soils rich in plant-food but also rich in the detrimental alkali. When cleared they form as excellent grasslands as the blacksoil plains, but they contain the same defects from the agricultural point of view. If heavy rain follows a bush fire on the brigalow outskirts of blacksoil plains, the brigalow tends to spread over the plain, but when fires are not followed by rain the plain spreads at the expense of the brigalow, except where the prickly-pear saves the brigalow, as is the general rule to-day. Like other wattles, the brigalow needs a bush fire to crack the seeds in order that they may germinate. Brigalow and box also change places at intervals. If a brigalow belt which is not heavily charged with alkali gets destroyed under unfavourable conditions for the germination of the seed, box (*Eucalyptus populifolia*) may replace the brigalow. On the other hand, if a box flat has its drainage interfered with so as to accumulate alkali on the flat, the box will get replaced by brigalow.

Brigalow and Prickly-pear.—It is a most noticeable fact that the prickly-pear everywhere enters into close partnership with brigalow. Eventually by checking bush fires it will kill out the brigalow. The brigalow soils are ideal for prickly-pear, and the shade of the brigalow offers shelter to the pear from the direct rays of the sun. It is hardly to be doubted that the prickly-pear is a lover of saline land, especially rich saline land. This fact came under the writer's notice through a walk along the beach from Sandgate to Cribb Island. We find prickly-pear in various places along the foreshores of Deception Bay, where seaspray is carried over the land, and back from the sea over areas which have been only recently salt marshes or arms of the sea. The pear does not spread back over the leached soils of the higher lands, because these soils contain no salts. With a view of testing this explanation, the writer collected three type soils—

No. 460.—Typical brigalow soil with dense pear spreading fast, 40 miles north of Roma-Durham Downs road.

No. 461.—Typical belah soil, with some pear, healthy but not spreading as fast as in the brigalow. Same road, 30 miles north of Roma.

No. 462.—Typical box soil. Some pear, but not healthy. 35 miles north-west of Roma, on Cornwall Station.

[TO BE CONTINUED.]

THE DISSEMINATION OF INTRODUCED PASTURE GRASSES IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Instructor in Agriculture.

That the continued prosperity of this State is to a large extent dependent upon our pastures is only too evident when we look at the trainloads of fat stock in transit to the various meatworks and large centres of population, the huge consignments of wool *en route* to ports for shipment overseas, and the returns from our butter and cheese factories.

In view of the fact that our grasses are such a valuable asset, it is somewhat surprising that so little attention has been given, more particularly by pastoralists, to their habits and characteristics. Even the testing of high quality indigenous varieties in areas where the more inferior sorts predominate would be a work of immense value and importance.

While dairy and other farmers are equally indifferent as to the merits of our native grasses, they must be credited with giving introduced varieties a fair amount of attention. It will be found that all those of any importance suitable to sub-tropical conditions will be met with in practically every locality in the coastal areas of Central Queensland. In all probability it would be a difficult matter to find a farm that has been under occupation for a few years upon which there are not two or three introduced varieties growing. Even in the cities they are well represented. In Rockhampton a collection can be secured on practically every allotment. The following is a list of those growing in my own backyard, all as far as I know having found their way there by natural agencies:—*Paspalum dilatatum*, Rhodes grass (*Chloris gayana*), *Chloris virgata*, *Chloris barbata*, Guinea grass (*Panicum maximum*), giant couch grass (*Panicum muticum*) red Natal grass (*Tricholæna rosea*), prairie grass (*Bromus uniloides*), and buffalo grass (*Stenotaphrum americanum*).

The actual area of pastures in Central Queensland sown down with introduced grasses is somewhat difficult to estimate, but in all probability it would be in the vicinity of 40,000 acres.

The notes hereunder will give some idea as to the distribution of the respective varieties.

RHODES GRASS (*CHLORIS GAYANA*).

Of the area under introduced grasses in Central Queensland, this variety would undoubtedly claim 95 per cent. When paspalum was boomed some twenty years ago, it found its way on to practically every farm, being invariably sown among the indigenous growths. The extensive areas of scrub country existing at Mount Larcom, Barmoya, Dawson Valley, and other places had not then been opened up. In the course of recent years thousands of acres of scrub have disappeared, and in its place are waving fields of succulent Rhodes grass. To the scrub settler this grass has several points in its favour. For example, the cost of seeding an acre is little more than the labour of sowing the seed. No covering is required, germination is invariably good, and subsequent growth rapid; in fact, it is generally too rapid, the average settler finding a difficulty in keeping it from growing rank and running to seed. To say that 50 per cent. of the material is wasted during the first three years after being seeded down would be a very conservative statement. A commencement has, however, been made to harvest this grass for hay, more particularly in the Mount Larcom and Barmoya districts.

Rhodes grass is undoubtedly a great drought-resister. Instances have been noted where it has practically disappeared during prolonged droughts, but this was evidently due to overstocking, adjacent paddocks not so heavily grazed not being affected.

PASPALUM DILATATUM.

Although occasional paddocks are met with, most of the paspalum grown is to be found in low-lying situations as a mixture among the native sorts. It is really only suitable for coastal localities enjoying a heavy and well-distributed rainfall. Given those conditions, it is undoubtedly of great value to the dairy farmer, but for fattening purposes it does not find much favour.

GIANT COUCH OR PARA GRASS (*PANICUM MUTICUM*).

This grass is well distributed throughout the Central District, but individual areas are by no means extensive. That it is not more largely grown is not through any lack of recognition of its value, but more as a result of the difficulty and expense entailed in establishing it on a large scale. It is not only a very shy seeder, but the seeds shatter as soon as they mature; therefore, propagation has to be carried out by means of cuttings or roots. One of the quickest methods of establishing it is to run the long shoots through a chaffcutter, using only one knife, and the long cut. The resultant cuttings are then distributed in a furrow and covered lightly. Being susceptible to frost, this grass is only suitable for coastal areas. It is one of the best varieties for growing along the banks of creeks, binding embankments, &c. It will also withstand submerging for some time, and salt water does not seem to harm it, as it is to be found growing on the banks of the Fitzroy, where the tidal waters cover it occasionally. As a result of its luxuriant habit of growth, it will smother out nut grass and other noxious weeds, including even prickly-pear. Although coarse, it makes a very good chaff for home consumption, a peculiar characteristic being that it will retain its succulence to such an extent when stacked away as a cured hay that when cut into chaff it will ferment in the bag.

CHLORIS VIRGATA (No Common Name).

Isolated patches of Virgata are to be met with in most of the Rhodes grass areas, but, being less aggressive than the Gayana, it is not likely to become at all prominent. It has a more upright habit of growth, and does not send out surface running shoots so freely as the common Rhodes. It can be distinguished by its lighter inflorescence, while the seed head does not open up and assume the characteristic star shape of most varieties of the Chloris family. No effort has been made to establish it as a separate variety on a large scale.

A variety of Chloris, known as the "Australian Rhodes Grass" (*C. barbata*) although not credited with being an introduction, was rarely met with in the coastal areas until a few years ago. In the Journal of February, 1912, the writer made reference to this grass as having made it appearance in the Charters Towers district. As a result of the remarks made, seed was obtained from that centre and grown in many localities where it had not hitherto made its appearance. In the recently cleared scrub lands, more particularly at Mount Larcom and the Dawson Valley, fairly considerable areas of *barbata* are in existence. It is also becoming a prominent feature along the various railway lines, notably at Ambrose, North Coast Line. It makes its appearance early in the spring, but, being more of a surface-rooter, it is less drought-resistant than ordinary Rhodes grass. A heavy seeder, it will establish itself very quickly on any bare patches of land adjacent to where it is growing. It has a high nutritive value and is relished by stock.

GUINEA GRASS (*PANICUM MAXIMUM*).

Isolated patches of this grass are to be met with on most of the farms along the coast. Although it seeds very freely and germinates readily, it is not likely to become

a useful pasture grass, for the simple reason that it will not stand grazing. At many places on the railway line between Cairns and the range this grass had at one time practically taken possession. Although 6 to 8 ft. high inside the fences, outside in the adjacent paddocks not a plant was to be seen. It provides a large amount of green succulent material, but it has to be cut before it reaches the seeding stage, otherwise it gets very hard and wiry.

PRAIRIE GRASS (*BROMUS UNILOIDES*).

Repeated attempts have been made by dairy farmers to grow this useful winter grass, but results have not been of a very promising nature. Prairie requires a fair amount of moisture, and as the winters in the Central district are invariably dry, the future for this variety is not very encouraging.

CANARY GRASS (*PHALARIS BULBOSA*).

This winter variety has been tried in various parts of the Central district, but, so far, little enthusiasm has been shown over its introduction. This is mainly on account of two important requirements, namely—winter moisture and the attention practically of a cultivated crop.

RED NATAL GRASS (*TRICHOLŒNA ROSEA*).

According to records, this grass was introduced into Queensland as an ornamental variety as far back as 1876. Tests in regard to its value as pasture were carried out at Mackay and other northern districts twenty-five years ago. They were not too favourable, for while producing a large amount of fodder it was found to be more or less of an annual. Since that time its distribution has largely been by natural agencies, its first appearance in a district being invariably along the railway line. Although a strong grower, it is by no means aggressive, and will rarely establish itself among other sorts. On bare ground, or on vacant cultivated land, the wind-carried seeds germinate readily, and given favourable climatic conditions, subsequent growth will be exceedingly rapid. This invasion is often a distinct advantage as, for instance, in scrub areas where a poor germination has been secured of Rhodes grass, red Natal will take possession of the bare patches, which otherwise would become overrun with weeds and undergrowth. Its wind-carried seeds makes it more or less of a pest if growing adjacent to cultivated areas. Frost cuts it down, but, owing to mild climatic conditions, it has continued to bloom right throughout the present winter. In some of the cleared scrub areas, red Natal has become quite a feature of the landscape. Although the area under paspalum is difficult to estimate, even approximately, yet in all probability red Natal would more than equal it, and thus take second place to Rhodes.

BUFFALO GRASS (*STENOTAPHRUM AMERICANUM*).

Small areas of buffalo are to be met with throughout the Central district, but on account of its coarse nature there has not been any attempt to establish it as a pasture. Stock are invariably to be found grazing on it early in the morning while wet with due. I have been informed by bullock-drivers engaged in the timber industry in the Cooroy district that their teams do well on this grass, preferring it to the more succulent paspalum.

KIKUYU (*PENNISETUM LONGISTYLUM*).

This variety has not so far been grown to any extent, having only been introduced to Australia in 1919. It promises, by its habit of growth, to be a valuable addition to the list of introduced sorts. It has not yet exhibited any signs of seeding, and, as propagation will have to be carried out by cuttings, its distribution on an extensive scale is not likely to be rapid.

RESULTS OF THE JUVENILE CORN-GROWING COMPETITION, 1920-21.

Owing to various causes, principally the dry period experienced in February, only seventy-two out of the original 156 entrants complied with the conditions of the competition.

The quality of the cobs forwarded from most districts may, on the whole, be regarded as highly satisfactory; some, however, showed lack of type character and uniformity. Shelling percentages were generally very satisfactory, reaching as high as 87.93, whilst only two competitors sent cobs giving less than 80 per cent.

Owing to the increased number of competitors and a somewhat irregular season, the average yield for the whole competition was slightly under that of the previous year, and works out at 52.24 bushels per acre. The highest yield was obtained in the Alberton (South Coast) district, where 122.2 bushels per acre were obtained.

The following are the tabled results of actual yields of plots for 1920-21:—

No. of plots.	Return per acre.
3	Below 20 bushels
22	Ranging from 20 to 40 „
21	„ 40 to 60 „
17	„ 60 to 80 „
5	„ 80 to 100 „
4	„ 100 to 122.2 „

The awards made in connection with the competition are shown in tabulated form.

PRIZE WINNERS.

RESULTS OF JUVENILE CORN-GROWING COMPETITION, 1920-21.

Name of Competitor.	Age.	Yield per Acre in Bushels.	Points Awarded for Yield—Maximum Points, 75.	Quality of Grain and Uniformity of Ear—Maximum Points, 15.	Records of Field Data—Maximum Points, 10.	Total Points—Maximum 100.	Remarks.
SPECIAL PRIZES.							
Miss E. Marks, Alberton	15 5/6	122·2	75	6·8	5	86·8	No. 1 Dist. 1st, £10.
T. A. Smoothy, Pinelands	17	113·3	69·6	10·1	6	85·7	No. 3 Dist. 2nd, £5.
H. M. McGinn, Oakey Ck., *via* Eumundi	14½	113·5	69·7	8·2	4	81·9	No. 2 Dist. 3rd, £3
No. 1 DISTRICT.							
Miss E. Marks, Alberton	15 5/6	122·2	75	6·8	5	86·8	1st, £5
W. Schmidt, Alberton ..	13	73·9	45·4	9·3	4	58·7	2nd, £2.
A. Schmidt, Alberton ..	14	69·4	42·6	8·6	4	55·2	3rd, £1.
R. Jonasson, Alberton ..	12½	66·5	40·8	9·9	4	54·7	
L. C. Jonasson, Alberton	15 1/12	67·19	41·3	7·8	5	54·1	
H. Beitz, Alberton ..	13 1/12	64·1	39·4	8·9	3	51·3	
M. M. Noe, Rathdowney..	16 1/12	40·4	24·8	8·1	3	35·9	
F. W. Noe, Rathdowney..	18	41·59	25·5	7·2	3	35·7	
H. J. Dunn, Cryna ..	11	34·18	21·0	9·7	3	33·7	
W. E. Patterson, Glamorgan Vale	18	31·6	19·4	6·97	3	29·37	
E. Voigt, Lark Hill, Walloon	13 1/12	28·9	17·7	7·27	4	28·97	
R. Behm, Mt. Forbes ..	16¼	22·6	13·8	10	5	28·8	
W. O. Griffiths, Mt. Forbes	18	21·04	12·9	9·1	5	27	
H. Gray, Cryna	12	23·99	14·7	8·9	2	25·6	
J. J. Patterson, Glamorgan Vale	13	23·3	14·3	6·2	3	23·5	
E. Wilkinson, Boyland ..	15	18·6	11·4	5·4	3	19·8	
No. 2 DISTRICT.							
M. H. McGinn, Oakey Ck., *via* Eumundi	14½	113·5	69·7	8·2	4	81·9	1st Prize, £5
C. G. Adcock, Eel Creek, Gympie	17 7/12	94·5	58	9·1	9	76·1	2nd, £2.
A. G. McGinn, Oakey Creek, *via* Eumundi	16½	104·6	64·3	7·27	4	75·57	3rd, £1
N. J. Gordon, Cedar Creek	16	84·9	52·2	8·1	1	61·3	
S. Mountford, Woodford	8	70	43·0	9·0	3	55·0	
D. Mountford, Woodford	10	67·3	41·3	8·5	3	52·8	
V. T. Greensill, Mungar ..	12¾	62·04	38·1	7·9	2	48·0	
F. Carseldine, Woodford	11⅓	55·9	34·3	9·5	3	46·8	
H. J. Carseldine, Woodford	16⅙	53·9	33·1	9·6	3	45·7	
A. T. Hill, Fairneyview ..	10	49·3	30·3	7·4	3	40·7	
W. F. Nugent, Coal Creek	16⅙	42·5	26·1	7·5	3	36·6	
M. Pacey, Wanora ..	11⅔	39·4	24·2	5·8	3	33	
N. J. Kersnovske, Mungar	13	36·3	22·3	6·6	3	31·9	
M. H. Fielding, Mungar ..	16	29·1	17·8	7·27	6	31·07	
E. Nugent, Coal Creek, Esk	14 7/12	35·0	21·5	7·2	2	30·7	
G. J. Nolan, Fernvale ..	13	29·5	18·1	5·3	3	26·4	
J. P. Elliott, Woodford ..	14¼	27·5	16·9	7·1	2	26·0	

RESULTS OF JUVENILE CORN-GROWING COMPETITION, 1920-21—*continued.*

Name of Competitor.	Age.	Yield per Acre in Bushels.	Points Awarded for Yield—Maximum Points, 75.	Quality of Grain and Uniformity of Ear—Maximum Points, 15.	Records Field Data—Points, 10.	Total Points—Maximum 100.	Remarks.
		No. 3 District.					
T. A. Smoothy, Pinelands	17	113·3	69·6	10·1	6	85·7	1st, £5.
H. Morgenstein, Pinelands	18	76	46·7	10·6	4	61·3	2nd, £2.
J. Morgenstein, Pinelands	13	64·4	39·5	9·1	5	53·6	3rd, £1.
M. Thies, Pinelands ..	13 7/12	62·03	38·1	8·0	1	47·1	
C. J. Burgess, Pinelands ..	12	53·3	32·7	8·7	3	44·4	
L. P. Walker, Glenaven ..	14¼	49·2	30·2	7	6	43·2	
C. Thies, Pinelands ..	17½	47·3	29·0	9·6	4	42·6	
F. W. Pagel, Ma Ma Creek	13	16·3	10·0	7·1	1	18·1	
		No. 4 District.					
C. W. Rackemann, Tingoora	11¾	74·9	46	8·6	5	59·6	1st, £5.
H. G. Rackemann, Tingoora	14½	71·8	44·1	9·8	5	58·9	2nd, £2.
F. P. Farr, Reedsdale ..	14 11/12	71·8	44·1	6·7	4	54·8	3rd, £1.
C. Black, Kumbia ..	9	55·7	34·2	6·8	3	44	
A. Mickan, Silverleaf, *via* Murgon	18	42·1	25·8	10·27	6	42·07	
E. Nebe, Coolabunia ..	14 5/12	43·3	26·6	8·9	6	41·5	
M. Black, Kumbia ..	10	46·6	28·6	6·9	3	38·5	
V. L. Wenck, Booie road, Kingaroy	15	40·0	24·5	7·5	3	35·0	
E. W. Davy, Wattle Grove	13	37·6	23·1	7·7	3	33·8	
M. E. McNickol, Wooroolin	15	32·3	19·8	7·5	4	31·3	
S. J. Davy, Wattle Grove	10 11/12	29·2	17·9	7·1	3	28·0	
		No. 5 District.					
W. Gon Chee, Killarney ..	17	96·2	59·1	10·2	8	77·3	1st, £5.
B. Gon Chee, Killarney ..	13	88·3	54·2	8·6	5	67·8	2nd, £2.
R. Gon Chee, Killarney ..	11½	70·7	43·4	8·9	5	57·3	3rd, £1.
G. C. Black, Goomburra ..	16	45·3	27·8	8·77	5	41·57	
P. Dorfield, Wellcamp ..	15⅚	42·2	25·9	7·27	7	40·17	
E. Geitz, Allora	17	37·7	23·1	8·1	3	34·2	
J. T. Collard, Clifton ..	11	28·4	17·4	6·97	1	25·37	
J. W. Collard, Clifton ..	14	21·05	12·9	7·4	3	23·3	
A. Hooley, Fletcher's Siding	14⅓	18·7	11·4	7·2	3	21·6	
		No. 6 District.					
W. Mercdith, Gurgeena ..	16½	61·7	37·9	10·8	4	52·7	1st, £5.
E. D. Meredith, Gurgeena	14¼	61·4	37·7	10·27	4	51·97	2nd, £2.
C. G. Meredith, Gurgeena	14⅓	44·3	27·2	5·7	4	36·9	*
J. U. Meredith, Gurgeena	12¼	43·7	26·8	6·0	4	36·8	
		No. 7 District.					
V. Kussrow, Rosalie Plains	13 7/12	33·3	20·4	6·97	3	30·37	1st, £5.
T. Dunn, Hunterton ..	14	27·8	17	6·5	3	26·5	*
H. J. Stanford, Hunterton	14	26·4	16·2	7·0	3	26·2	
		No. 8 District.					
W. H. McLaughlin, Yeppoon	15 11/12	49·1	30·1	8·4	4	42·5	No prize*
		No. 9 District.					
S. Favier, Kairi	10	85·9	52·8	6·9	1	60·7	1st, £5.
C. A. Schroder, Kairi ..	13 5/12	58·3	35·8	8·3	6	50·1	*
E. F. Pasetti, Kairi ..	16 11/12	49·4	30·3	5·9	2	38·2	

Special prizes of the value of £10, £5, and £3 will be awarded to the competitors who stand first, second, and third in the entire competition.

DISTRICT PRIZES.—First, £5; Second, £2; Third, £1.

* If there are less than six competitors, prizes will be allotted as follows :—

Four to five competitors (inclusive), two prizes, first and second.

Two to three „ „ one prize only, first.

When only one competitor, he, or she, will be debarred from participating in the District Prize, but will be eligible to compete for the Special Prizes.

No money prizes will be given, but each successful competitor will be allowed to select some article to the value of his prize.

Photo., "The Week."

PLATE 47.—THE ARENA, GYMPIE SHOW, 1921.

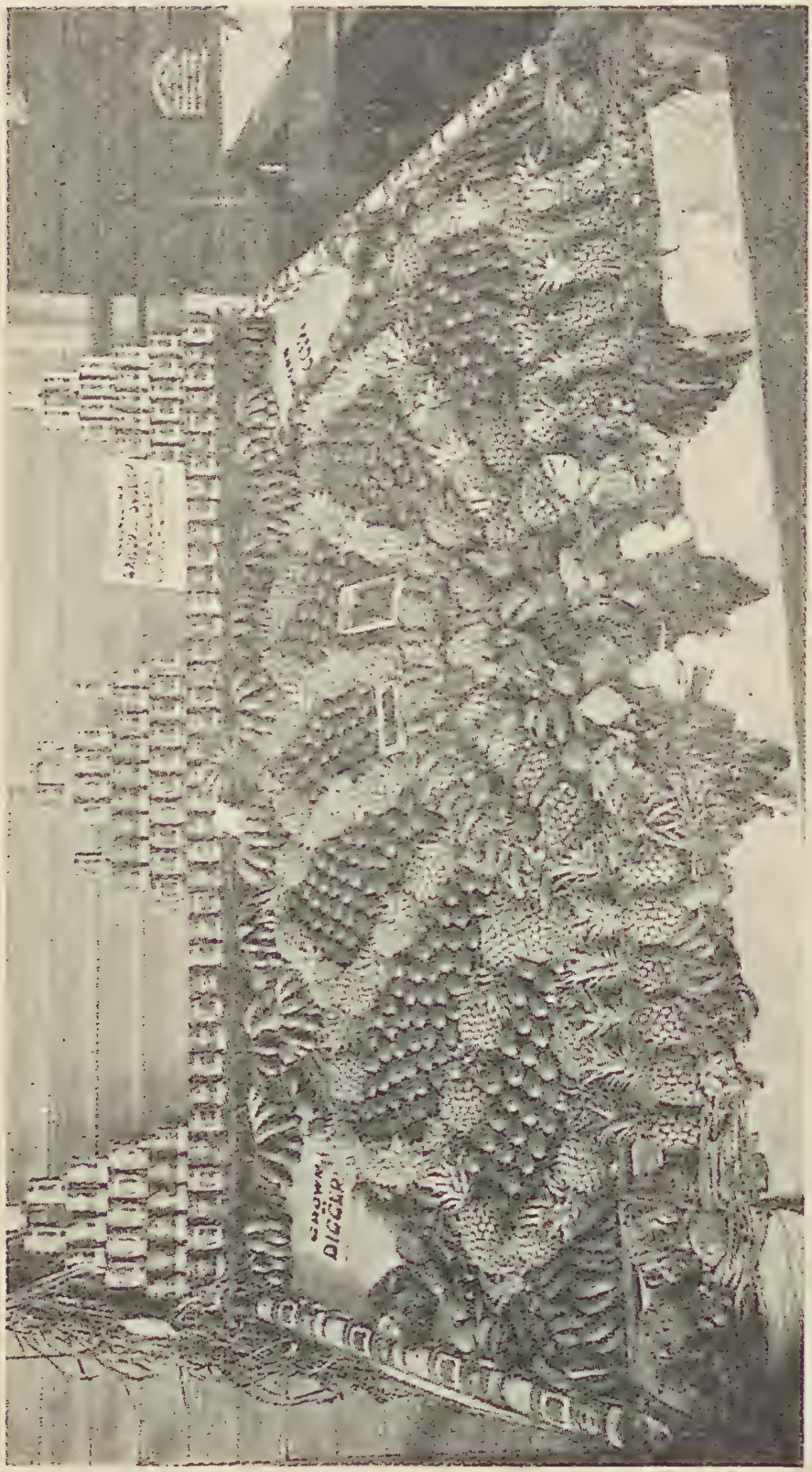


Photo., "The Week."

Plate 48.—Returned Soldier Settlers' Fruit Display, Gympie Show, 1921.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records of Cows for August, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Bellona	Ayrshire ..	26 June, 1921	1,277	4·1	58·58	
Thyra of Myrtleview	,, ...	31 July ,,	1,387	3·6	55·48	
Iron Plate	Jersey ...	12 July ,,	929	5·1	55·43	
Prim	Holstein ...	9 Mar. ,,	1,146	4·0	51·36	
College Mignon ...	Jersey ...	7 July ,,	832	5·0	48·73	
College Cold Iron	,, ...	10 Mar. ,,	783	4·4	38·67	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	832	4·0	37·18	
Miss Betty ...	Jersey ...	7 July ,,	779	4·2	36·66	
Charming Damsel	Ayrshire ...	12 May ,,	627	4·0	28·51	
Wattle Blossom ...	Guernsey ...	21 May ,,	519	4·7	27·47	
Miss Fearless ...	Ayrshire ...	21 May ,,	584	3·9	25·41	
Confidence... ...	,, ...	8 Feb. ,,	521	4·3	25·11	
College Cobalt ...	Jersey ...	6 Jan. ,,	428	5·0	25·03	
Hedges Dutchmaid	Holstein ...	26 May ,,	597	3·7	24·58	
Maguet's Leda ...	Jersey ...	6 Oct., 1920	447	4·8	24·18	
Rosine	Ayrshire ...	19 Jan., 1921	555	5·9	24·14	
Lilia	,, ..	3 April ,,	521	4·1	23·89	
College Grandeur	Jersey ...	29 Dec., 1920	412	4·9	23·62	
Netherton Belle ...	Ayrshire ...	30 Oct. ,,	487	4·3	23·49	
Confidante ...	,, ...	12 May, 1921	464	4·5	23·46	
Royal Mistress ...	,, ..	19 Mar. ,,	585	3·6	23·40	
Comedienne ...	Jersey ..	26 Nov., 1920	394	5·0	23·04	
Hedges Madge ...	Holstein ...	15 Aug., 1921	570	3·6	22·80	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	385	5·9	22·52	
College Ma Petite	,, ...	23 Oct. ,,	367	5.2	22·36	
Affection of Gowrie Park	Ayrshire ...	8 Sept., 1921	509	3·9	22·15	
College Meadow Sweet	Holstein ...	15 May ,,	512	3·8	21·67	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	340	5·2	20·63	
Snowflake	Shorthorn...	21 Dec., 1920	427	4·3	20·59	
Thornton Fairetta	Jersey ..	15 Mar., 1921	331	5·2	20·14	

NEUTRALISATION OF ACID IN CREAM.

By FREDERIC J. WATSON, Instructor in Dairying, Department of Agriculture and Stock.

Owing to the acid condition in which farm-separated cream is delivered to factories, especially during the summer months, it is necessary, in preparing it for pasteurisation, to reduce the acid in the cream to between .2 per centum and .3 per centum.

The complexity of the physical and chemical make-up of cream, its susceptibility to a variety of changes in composition, together with irregularities in the preparation and use of neutralisers, frequently cause fluctuations in the results of neutralisation, and interferes with the desired accuracy of results of neutralisation.

It is, therefore, advisable in neutralising cream, to aim at obtaining a standard of acid of .25 per centum in order that possible fluctuations in results may not endanger the quality of the butter made from the cream.

The following remarks on neutralisation are obtained from the publications on the dairy industry by Otto F. Hunziker, a high American authority on butter manufacture, who has made an exhaustive study of the matter.

OBJECTS OF NEUTRALISATION.

1. To avoid excessive loss of fats that results from churning cream that is pasteurised while extremely sour.

2. To guard against the production of undesirable flavours in cream, which are prone to result when cream high in acid is pasteurised at a high temperature.

3. To improve the keeping quality of butter made from high-acid cream. (Butter made from high-acid cream does not keep well.)

These are among the objects that can be accomplished by neutralisation. They all hinge on the reduction of the acid in sour cream before pasteurisation.

Improvement of the flavour of butter made from tainted cream, or the removal of rancidity by neutralisation, is not possible. This fact has been conclusively established.

When neutralising cream it is essential that the following particulars should be observed:—

(1) Adoption of a definite standard of acidity.
(2) Correct and accurate test for acidity. (This may be made by means of a decinormal alkali (caustic soda) solution, using phenolphthalein as an indicator.)
(3) Choice and use of the right kind of neutraliser.
(4) Making right strength of neutraliser.
(5) Adding the neutraliser to the cream in the right manner.
(6) Checking of results by retesting.

NEUTRALISERS.

Neutralisers must have alkaline properties, must be alkalies, or alkaline earths or their carbonates.

Alkali is a substance that neutralises acids, forms salts, and that saponifies fats.

Common alkalies that have found application in factories are carbonate of sodium (soda ash) and of calcium (chalk), bicarbonate of soda (baking soda), hydrate of soda (soda lye), of calcium in the form of lime water and milk of lime, and the oxides of calcium and magnesium (quick lime and magnesium lime).

Carbonate and bicarbonate of soda are readily soluble, and therefore are easily made up into solutions of desired strength. This is a distinct advantage.

Calcium carbonate is very insoluble and slow of action, and therefore unsuitable for the purpose.

All carbonates liberate carbon-dioxide gas when added to sour cream. This is claimed by some to be an advantage, for the reason that when the carbon-dioxide gas is percolating upwards through the cream it carries with it volatile gases with objectionable odours, and thereby removes from the cream undesirable odours and flavours. The extent and value of this claim has been found to be over-rated and the subsequent inprovement of the butter overestimated.

The disadvantage of the use of carbonates and bicarbonates is that they deprive the operator of the ability of checking his work, because the carbon dioxide formed in the cream when these neutralisers are used reacts acid, causing the test to show higher acidity than the lactic acid content of the cream represents.

The generation of carbon-dioxide gas in sour cream by the use of carbonates and bicarbonates often presents mechanical difficulties, causing the cream to foam up and over the vat unless they are used with great care.

Carbonates and bicarbonates are liable to corrode metal surfaces of vats and coils, causing chemical compounds which are injurious to the quality of the cream.

Butter made from cream neutralised with soda lye, sodium carbonate, or sodium bicarbonate is prone to have a soapy flavour. This is especially true of cream of high original acidity and cream in which the acidity is reduced to the neutral point.

Of the hydrates, lime appears to be the only really suitable alkali to use. It is mild in action, does not injure the flavour of the butter if used intelligently, does not appreciably attack metals of vats and other equipment, it tends to form, with that portion of the cream with which it reacts, a precipitate of relatively great

stability and resistance against bacterial action, and it combines with the curd, first rendering that portion of the curd which enters into the composition of the butter less acid, thereby minimising the acidity of the butter and its deteriorating power.

Sodium hydrate, the cheapest form of which is soda lye, has strong caustic properties, and the sodium lactate formed in sour cream has injurious effect on the metal of vats and coils, and causes butter to contain metallic salts detrimental to its flavour and keeping qualities.

With lime hydrate (slaked lime) properly prepared and intelligently used, and using sufficient quantity only to reduce the acidity to .25 per cent. or thereabout, no objectionable flavour effects occur.

Limy flavour in butter is due to the abuse of lime, resulting from inaccurate and faulty methods.

Limy flavour may show when the lime mix is too concentrated and is not adequately diluted when added to cream.

Another common cause of limy flavour, due to over-neutralisation, lies in the fact that when liming is done by guess only, the cream is usually tested after neutralisation, and if the acidity is higher than desired, more neutraliser is added. Since the action of lime is slow and is not completed until after the cream is pasteurised, it is obvious that the acid test made immediately after neutralisation does not indicate the true ultimate acidity of the cream. If more lime is added on the basis of this test, there is a danger of over-neutralisation, resulting in limy flavour and other defects.

Finally, lime is a natural constituent of milk and butter; it is not only harmless, but represents one of the essential minerals required by the human body for maintenance and, especially, for growth.

[Opinions differ as to the use of lime as a neutraliser, and it is not generally recommended by officers of this Department, who prefer bi-carbonate of soda for the reasons already set out by Mr. Watson.—Ed.]

If any portion of the neutraliser, however small, enters into the composition of butter, it is essential that it add to, rather than detract from, the healthfulness and dietetic value of the butter.

From the standpoint of the consumer, therefore, it is not only the least harmful, but, in fact, the most beneficial, and hence the most suitable, alkali for the neutralisation of cream.

On account of its slight solubility in water, viz., to the extent of .137 per cent. in cold water and .075 in boiling hot water, lime in the form of a clear solution of lime in water is unsuitable, for the reason that to reduce acidity in cream from .85 per cent. to .25 per cent. it would require the volume of lime water to be twice the volume of the cream to be neutralised.

It must, therefore, be used as milk of lime. The lime mixture may be made of calcium oxide (quicklime), in which case time must be taken to thoroughly slake it. Or it may be made of lime hydrate (slaked lime).

If incompletely slaked, slaked lime is unsatisfactory, as it generally contains much lime carbonate, which is coarse, does not strain readily, is insoluble, and is slow of action in the cream.

Thirty-seven pounds of dry lime hydrate will neutralise 90 lb. of lactic acid, hence the amount of lime hydrate required to neutralise .01 lb. or .01 per cent. of lactic acid in 100 lb. of cream is .00411 lb.

But the lime hydrate is not added to the cream in dry form, but as milk of lime, consisting of 2 lb. of lime in 1 gall. of mixture; therefore, the amount of lime mixture required to neutralise .01 per cent. of lactic acid in 100 lb. of cream is .01644 lb.

Example:—2,000 lb. of cream contains .6 per cent. of acid which is required to be reduced to .25 per cent.

Original acid in cream	.6 per cent.
Acid required	.25 per cent.
Acid to be neutralised	.35 per cent.

Therefore, lime mixture = .35 × 2,000 × .01644 = 11.5 pints.

However, neutralisation of sour cream and neutralisation of an aqueous solution of lactic acid are two vastly different things; and it has been conclusively demonstrated, by the authority abovementioned, both by laboratory and factory tests, that while in aqueous acid solution the neutralising action of lime is complete, in cream

not all the lime added goes to neutralise the lactic acid present. These tests have shown that for neutralisation purposes it is necessary to use in the neutraliser mixture 2.4 lb. of lime instead of 2 lb.; or to use a type of hydrated lime which has a stronger alkalinity, such as magnesium lime, which contains, in addition to calcium hydrate, 30 to 50 per centum of magnesium oxide, and their actual neutralising strength averages 16 per cent. to 20 per cent. greater than hydrated lime containing 100 per cent. of calcium hydrate.

When using magnesium lime, 2 lb. in the gallon of mixture is sufficient.

The reason for the incomplete reaction of lime in cream is due to the affinity of lime for curd. While the lime is capable of, and does, exert its full neutralising strength in aqueous solutions of lactic acid, a portion of the lime (about 16 to 20 per cent.) when added to cream fails to act on the lactic acid.

In explanation of this, it is well known that casein has a marked affinity for calcium. In raw sweet milk and cream the casein is present as a calcium salt. When cream becomes sour, the lactic acid thus formed removes calcium from the casein. This leaves a part of the casein as free casein, which is a solid, and a part occurs as casein lactate, which is in colloidal state.

The casein lactate, however, is readily hydrolised; upon neutralisation it is precipitated, becoming solid, so that from the standpoint of neutralisation of cream it may be considered equivalent to free casein.

When lime is added to the sour cream the concentration of the acid is very greatly reduced, and the concentration of the casein increased to excess. In the presence of free casein these conditions are most favourable to the formation of calcuim caseinate.

Since both the lime, in the form of milk of lime, and the casein are in a similar physical state, and have a specific chemical attraction for each other, it appears unnecessary for the calcuim to go into solution in order to react on the casein.

SUMMARY OF THE ACTION OF LIME ON CREAM.

1. When a sufficient amount of lime is added to sour cream to theoretically reduce the acidity in cream to .25 per centum, and the lime fails to accomplish the full extent of this reduction, about 16 to 20 per centum of the lime does not react.

2. This delinquency may be corrected by using approximately 20 per centum more lime hydrate, thus making the lime mixture about 16 per centum stronger than required theoretically, or by using magnesium lime instead of calcium lime. Magnesium lime containing 35 to 50 per cent. of magnesium oxide has an alkalinity equivalent in strength to approximately 116 per cent. to 120 per cent. of pure calcium lime.

3. Lime has a marked affinity for casein. The absorption of lime by the casein, and the reduction of the casein acid, are greater than the absorption of lime by the serum, and the reduction of the lactic acid.

4. When neutralisation is carried to the neutral point, the distribution of the neutralising action in the components of the cream—the serum, curd, and fat—is similar with sodium hydrate as it is with lime water.

5. The acid test of the cream determines the total acidity of the cream, including both the casein acid and the lactic acid.

6. The deficiency of the neutralising action of the lime is due to physical and mechanical combinations between portions of insoluble lime and curd. The fact that from 16 per cent. to 20 per cent. of the lime does not react in the cream must be attributed to the great affinity of the lime for casein, particles of lime adhering and becoming permanently attached to particles of free casein. In this condition the lime so held is unable to exert its full neutralising action.

INSTRUCTIONS FOR NEUTRALISING WITH LIME.

1. Secure hydrated lime (slaked lime) that is relatively free from carbonates.

If the hydrated lime is a calcium lime (containing not over 5 per cent. of magnesium oxide), make up a lime mixture, or milk of lime, by using 2.4 lb. of the dry hydrated lime for every gallon of mixture.

2. If the hydrated lime is a magnesium lime containing not less than 30 per cent. to 35 per cent. of magnesium oxide, make a lime mixture, or milk of lime, by using 2 lb. of the dry hydrated lime for every gallon of mixture.

3. Magnesium lime is more satisfactory than calcium lime.

4. For making up lime mixture in small quantities, use a 10-gall. can; put into the can 24 lb. of calcium lime, or, preferably, 20 lb. of magnesium lime; fill half-full of water until emulsion is complete; then fill the can with water, and stir again. This now represents the milk of lime, lime mixture, or lime neutraliser.

Use the method abovementioned to calculate the quantity of the neutraliser required to reduce the acidity of the cream to .25 per cent.

7. Thoroughly stir the lime mixture in the can, and then measure out with a gallon measure, graduated to half-pints, the required amount of neutraliser, as indicated by the method of calculation abovementioned.

8. Strain it through a cheese cloth with a garden sprinkling-can, add an equal amount of water, and sprinkle the neutraliser over the cream in all parts of the vat.

9. Keep the cream agitated while the neutraliser is being added.

10. Always make sure that the quantity of cream and the test of original acid are correct, that the milk of lime has been properly mixed before removing the required amount from the lime-mixture can, and that the neutraliser is properly diluted before it is added to the cream.

11. It is advisable not to heat the cream above 90 degrees Fahr. before the neutraliser is added.

RAPID METHOD OF DETERMINING EXCESSIVE ACIDITY IN MILK.

By J. C. BRUNNICH and E. GRAHAM.

As it is a requirement of the "*Dairy Produce Act of* 1920" that all milk delivered to a cheese factory for cheesemaking purposes shall be graded in accordance with its quality, and that no milk containing more than .25 per cent. of acidity (lactic acid) shall be classified as first grade quality by a milk-grader at a cheese factory, there is occasioned a need for a rapid method of ascertaining the individual supplies of milk which may contain acidity in excess of that prescribed under the Act, and to this end we have devised a method, full particulars of which are given below.

APPARATUS.

The apparatus, which was made under our instructions by Messrs. Wilson and Nafis, consists of one 50 c.c. burette, graduated in the customary way in c.c. and one-

Plate 49.—Acidity Tester.

fifth part c.cs., and on the left side, marked to show 2.5 c.cs., the burette being fitted with an ordinary pincheock and fixed on a stand. A set of test tubes in a stand is provided. Each test tube has a frosted top to enable a distinguishing mark being applied to it for identification purposes, and has two graduation marks, the lower one to correspond to 2.5 c.cs., and the upper one to 11.5 c.cs. One metal measure to hold approximately 9 c.cs. of milk, one bottle of deci-normal $\frac{N}{(10)}$ alkali solution, and one drop bottle containing phenolphthalein.

METHOD OF MAKING A TEST.

The burette is charged with alkali solution and 2.5 c.cs. of same is run into each of the required number of test tubes. A sample of milk is drawn from each can after the contents are well mixed, by the aid of the metal measure, and this complement of milk is discharged into the test tube, filling the tube to the level of the higher graduation mark. The alkali solution and milk are then thoroughly mixed by closing the top of the tube with the thumb and inverting the tube several times. Afterwards a couple of drops of phenolphthalein is added to the mixture in the test tube, and at this stage it is well to observe if any pink colouration appears. The tube is again shaken, and if the colouring completely disappears it is evident that the milk contains a greater amount of acidity than is prescribed under the Act as applied to milk of first-class quality. On the other hand, where the more or less pinkish colour remains, a comparatively lower percentage of acidity is indicated, in which case the milk may be accepted as containing a lower percentage of acidity than is mentioned in the Act.

This completes the test, but should it be desirable to determine the actual percentage of acidity in the milk, the same apparatus may be used, and a slightly different method is to be followed by placing 9 c.cs. of milk, preferably measured with a 9 c.c. pipette (to be ordered specially) into a porcelain dish, adding to it several drops of phenolphthalein, and stirring the mixture with a glass rod, which can be obtained, showing in its interior a pink coloured paper of the exact tint to which the milk should be coloured, by the addition of the necessary amount of alkali run out from the burette.

Then, by reading the number of c.cs. of alkali discharged from the burette, and dividing same by 10, the actual percentage of lactic acid contained in the milk is ascertained.

A photograph, for the purpose of showing the complete apparatus necessary for the test, appears in conjunction with this article.

Photo. Live Stock Bulletin.]

Plate 50.—Charmer 2nd of City View (I.M.S.), the Property of Mr. M. Lawrence.

Winner of the Royal National Champion Butter Fat Test, 1921.

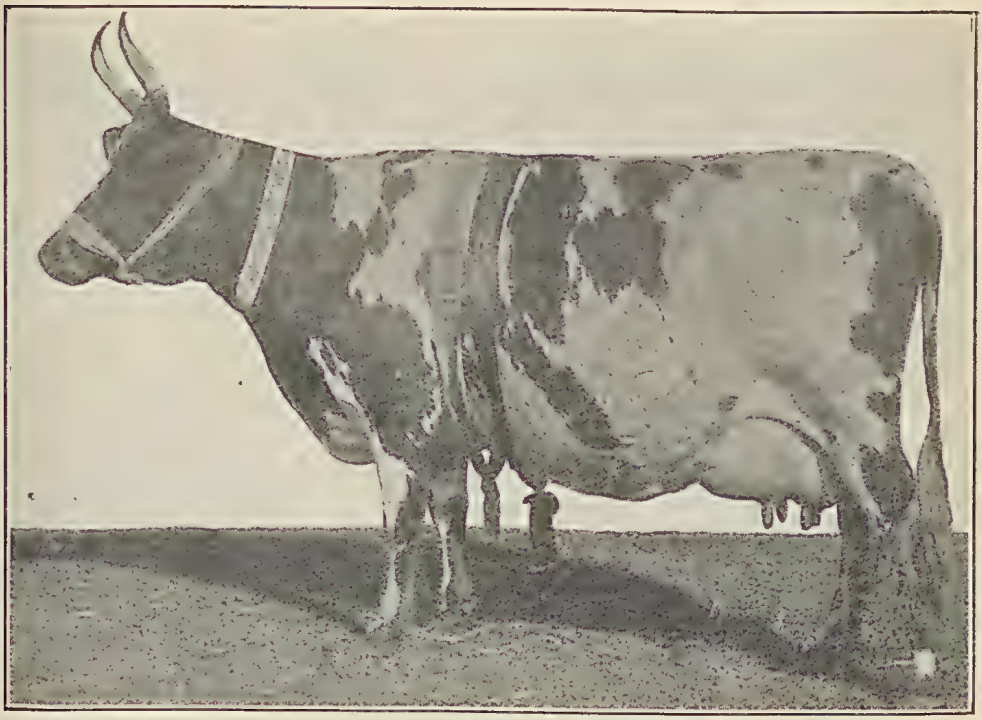


Plate 51.—Gaiety of Marinya, the Property of Mr. J. H. Fairfax.
First Prize Ayrshire Cow, 5 years or over, in milk; and Champion, Brisbane Exhibition, 1921.

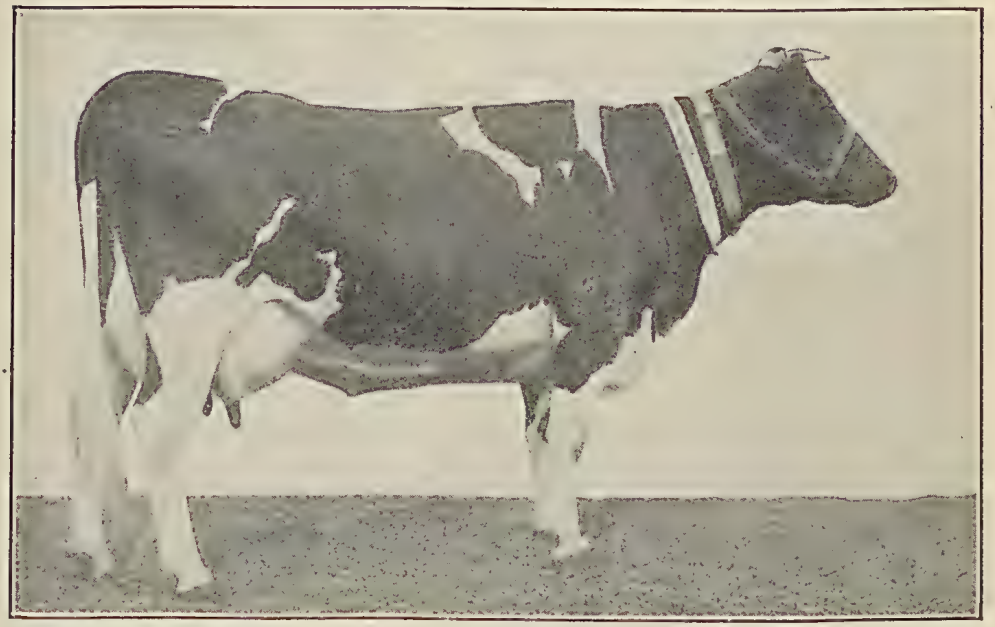


Plate 52.—Maggie 3rd of Nestles, the Property of Nestle's and Anglo-Swiss Condensed Milk Company.
Winner of Class for Cow yielding largest supply of milk in 48 hours, Brisbane Exhibition, 1921.

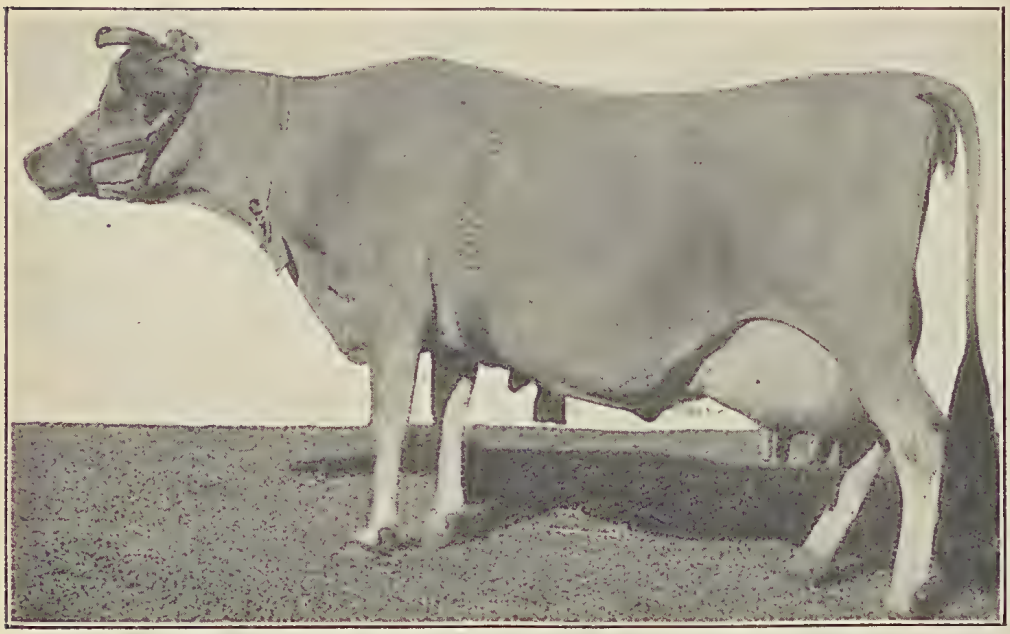


Plate 53.—Larkspur, the Property of Messrs. W. D. Carr.
First Prize Cow, 5 years old and over, in milk; winner of the Special Prize for Cow and three of her progeny; and Champion Jersey Cow, Brisbane Exhibition, 1921.

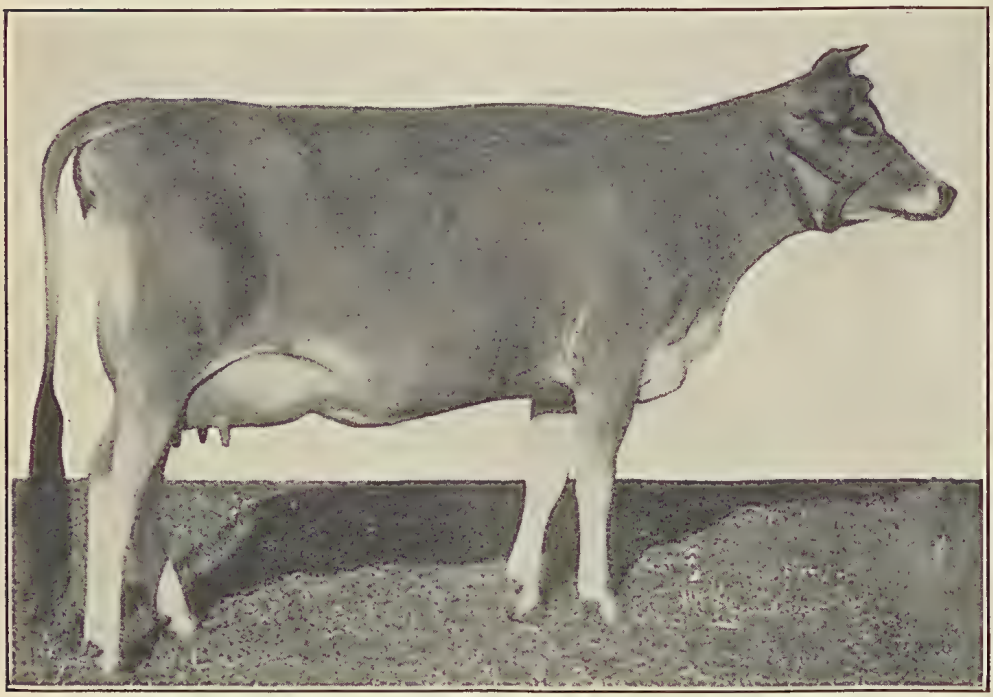


Plate 54.—Oxford Golden Buttercup, the Property of Mr. E. Burton.
First Prize Jersey Heifer, 2 years and under 3 years, in milk; 1st in Class for Heifer any breed, under 4 years, averaging the greatest daily yield of butter-fat for 48 hours,

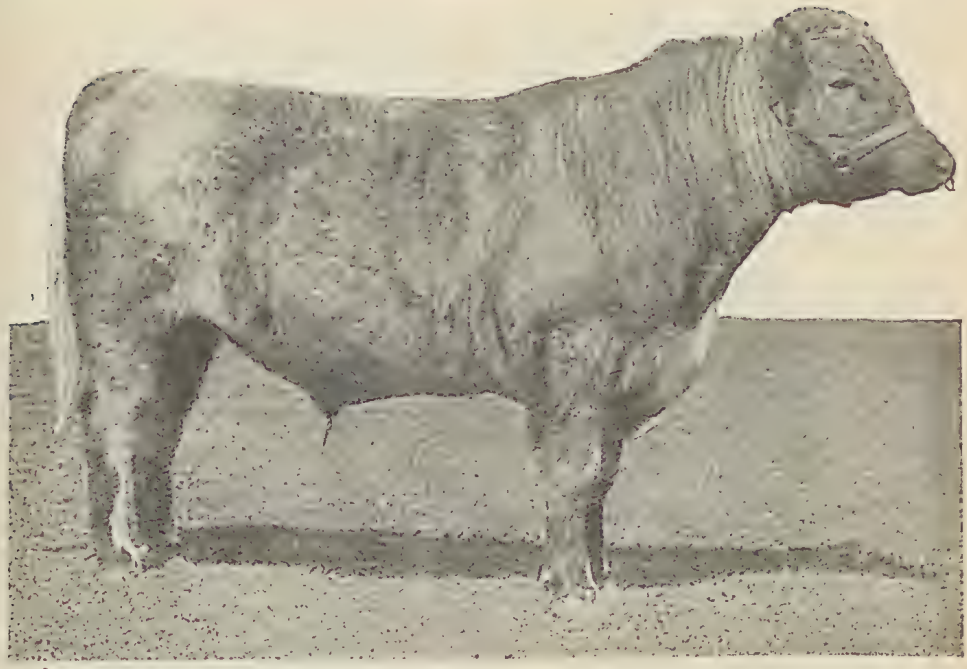


Photo. Live Stock Bulletin.]

PLATE 55.—LYNDHURST ROYAL PEER 24TH, THE PROPERTY OF MR. C. E. McDOUGALL.

First Prize Shorthorn Bull, 18 months and under 2 years. Royal National Association Exhibition, 1921.

Photo. Live Stock Bulletin.]

PLATE 56.—PROUD PEER OF TOLARNO, THE PROPERTY OF MR. G. C. CLARK

Champion Aberdeen Angus Bull of Queensland, 1921.

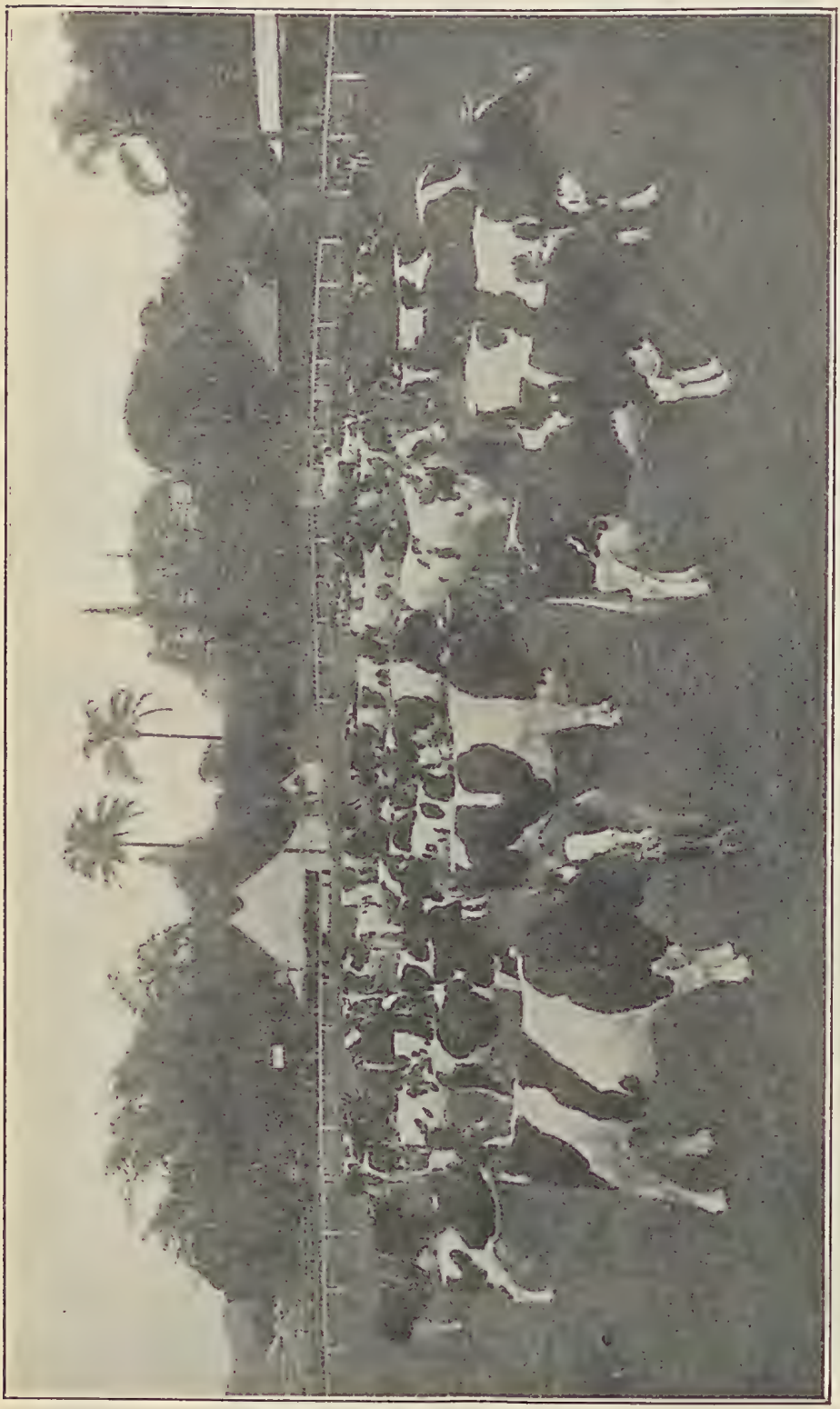


Plate 57.—Friesian Herd of Cattle, Brisbane Exhibition, 1921.

Exhibitors whose Herds were represented :—Queensland Agricultural College, S. H. Hosking, Nestles and Anglo-Swiss Condensed Milk Company, Grindles Ltd., Geo. Newman, P. P. Fult, F. G. Brown, C. Behrendorff, A. A. Petrie, A. G. Muller, E. C. McConnel, E J. Wecker, W. G. Reading.

The Horse.

CERTIFICATES OF SOUNDNESS.

August list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
Draught Stallions.		
Pride of Glenore ..	J. H. Kilvington ..	Forest Hill
Phœnix	Jondaryan Estate ..	Jondaryan
Clansman	F. J. Bishop	Herston Road, Kelvin Grove
King Arthur (L) ..	Queensland Agricultural College	Gatton
Donald Crystal (L) ..	L. E. Walker	Brisbane
Blood Stallions.		
Count Savin (L) ..	J. McGilp	Dalby
Delinacre (L)	L. Winten	"Vuna," Whitewood
Trotting Stallions.		
King Bells	R. Cox	Toowong
St. Malo	J. W. Hart	Blackbutt
Major Marcus	Rees, Thomas, Ltd. ..	Townsville
Tommy Holmes (L) ..	A. W. Baulch	Biggenden
Ribbonmont (L) ..	A. R. Carr	Zillmere
Ponies.		
Tibby (L)	R. Hanlon	Kangaroo Point, Brisbane
Comet (L)	E. J. Harris	Park Road, South Brisbane

BOT FLY.

By A. H. CORY, M.R.C.V.S.

To prevent the flies from finding a suitable lodgment for their eggs, the long hairs should be clipped off or singed from the nose, lips, jaws, shoulders, and legs of all horses. Regular daily grooming should be carried out to detach any fly eggs before they have time to hatch, and the parts from which the long hairs have been removed should be smeared daily with a mixture of linseed oil 20 parts, turpentine or kerosene 1 part. All manure containing bots or grubs should be destroyed by burning.

After a horse is affected, viz., when the bot fly grubs are in the stomach, medicines are of little service in removing them until the summer months, when they are being naturally expelled. It is then advisable to drench with one of the following drenches:—

(1) Turpentine 2 oz., mixed in 1 pint of milk; or

(2) Carbolic acid 2 drachms, glycerine 2 oz., water 4 oz., milk 1 pint.

Either of these drenches should be followed in a few hours by giving 5 drachms of aloes, as a ball, or 1 pint of raw linseed oil.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, AUGUST, 1921.

There was during August a seasonable increase in production. During the latter portion of the month the eggs were weighed, and full details of weights will appear in the report for September. There was one death during the month, Mrs. Anderson's "C" hen dying of tuberculosis. The laying of W. Becker's pen of Langshans was excellent, the total of 166 being the highest monthly score during the present test. For thirty-two days this pen of six birds did not lay less than five eggs per day. The following are the individual records:—

Competitors.	Breed.	Aug.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	138	628
*W. and G. W. Hindes	Do.	142	602
*J. M. Manson	Do.	147	601
H. C. Thomas	Do.	120	596
F. Birchall	Do.	123	588
Oakleigh Poultry Farm	Do.	129	574
*G. Trapp	Do.	125	572
*Mrs. R. Hodge	Do.	133	562
*C. M. Pickering	Do.	120	547
*H. Fraser	Do.	117	542
*H. C. Towers	Do.	126	542
R. C. Cole	Do.	119	541
*J. W. Newton	Do.	106	524
W. A. Wilson	Do.	121	522
*W. Becker	Do.	134	508
*T. Fanning	Do.	118	498
*Chris. Goos	Do.	121	493
Mrs. E. White	Do.	131	490
H. Stacey	Do.	127	487
Bathurst Poultry Farm	Do.	118	487
*E. Chester	Do.	113	485
*R. C. J. Turner	Do.	117	480
M. F. Newberry	Do.	120	475
O. C. Goos	Do.	111	470
W. Barron	Do.	103	469

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Aug.	Total.
LIGHT BREEDS—*continued.*			
*Thos. Taylor	White Leghorns	117	467
Mrs. E. Z. Cutcliffe	Do.	113	464
E. Stephenson	Do.	106	461
J. W. Short	Do.	109	456
*Thos. Eyre	Do.	110	455
*S. L. Grenier	Do.	121	453
*G. Williams	Do.	124	449
*B. Chester	Do.	113	417
*Mrs. L. Anderson	Do.	109	413
*Haden Poultry Farm	Do.	112	434
*W. and G. W. Hindes	Brown Leghorns	120	432
*E. A. Smith	White Leghorns	119	430
Linquenda Poultry Farm	Do.	124	427
W. M. Glover	Do.	108	396
*H. P. Clarke	Do.	110	387
Brampton Poultry Farm	Do.	101	358
HEAVY BREEDS.			
T. Fanning	Black Orpingtons	158	667
Jas. Potter	Do.	111	634
*J. Ferguson	Chinese Langshans	147	612
Rev. A. McAllister	Black Orpingtons	142	596
*T. Hindley	Do.	129	588
Jas. Every	Langshans	135	575
*A. E. Walters	Black Orpingtons	133	575
Jas. Ryan	Rhode Island Reds	136	572
W. Becker	Langshans	166	569
*R. Burns	Black Orpingtons	144	568
G. Muir	Do.	137	563
*Parisian Poultry Farm	Do.	144	553
*C. C. Dennis	Do.	138	550
*E. F. Dennis	Do.	129	524
*J. Cornwell	Do.	142	510
*E. Morris	Do.	133	505
*E. Stephenson	Do.	122	497
*R. Holmes	Do.	90	483
G. Cumming	Do.	119	467
*H. Chaille	Do.	109	414
*Mrs. G. Kettle	Do.	126	436
J. W. Newton	Do.	138	435
*N. A. Singer	Do.	138	431
*J. E. Smith	Do.	147	431
*A. Shanks	Do.	121	413
*E. Oakes	Do.	132	367
F. Harrington	Rhode Island Reds	135	346
T. C. Hart	Black Orpingtons	100	285
Total	...	8,599	34,438

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
W. and G. W. Hindes	109	89	101	114	111	78	602
J. M. Manson	91	106	109	92	111	92	601
Geo. Trapp	95	87	94	94	102	100	572
Mrs. R. Hodge	89	106	105	96	103	63	562
C. M. Pickering	100	95	87	81	107	77	547
H. Fraser	101	79	96	85	95	86	542
H. C. Towers	98	78	93	72	91	110	542
J. W. Newton	93	105	101	80	78	67	524
W. Becker	98	101	74	76	114	45	508
T. Fanning	95	78	83	78	74	90	498
Chris. Goos	87	105	51	57	72	121	493
E. Chester	85	89	81	77	75	78	485
R. C. J. Turner	85	75	76	67	86	91	480
Thos. Taylor	73	91	77	56	67	103	467
T. Eyre	76	77	50	81	89	82	455
S. L. Grenier	79	100	50	79	75	70	453
G. Williams	113	84	50	63	67	72	449
B. Chester	71	70	94	66	87	59	447
Mrs. L. Anderson	69	87	80	65	84	58	443
Haden Poultry Farm	66	61	73	77	71	86	434
W. and G. W. Hindes	59	61	54	92	70	96	432
E. A. Smith	102	78	74	70	65	46	430
H. P. Clarke	100	57	66	39	62	63	387
HEAVY BREEDS.							
J. Ferguson	106	94	89	113	105	105	612
T. Hindley	107	97	103	83	105	93	588
A. E. Walters	104	102	89	93	87	100	575
R. Burns	48	84	125	76	115	120	568
Parisian Poultry Farm	88	91	91	122	59	102	553
C. C. Dennis	102	84	74	101	93	96	550
E. F. Dennis	68	96	84	86	85	105	524
J. Cornwell	83	64	90	101	86	86	510
E. Morris	86	93	47	105	83	91	505
E. Stephenson	94	76	83	80	72	92	497
R. Holmes	63	77	81	96	110	56	483
H. Chaille	56	83	74	102	83	46	444
Mrs. G. Kettle	69	89	101	48	55	74	436
N. A. Singer	70	58	70	74	64	95	431
J. E. Smith	103	104	77	63	47	37	431
A. Shanks	43	71	59	77	80	83	413
E. Oakes	30	85	63	89	56	44	367

CUTHBERT POTTS,
Principal.

Horticulture.

HORTICULTURAL NOTES.

In the bush-house, caladiums will now need attention. Remove bulbs from storage and carefully scrape off any decay that may be found around base of bulb, and dust same with a little powdered charcoal. Pot in good, rich compost. Do not have the soil too fine. Leave a few peaty lumps, or the fibre portion of rotted turf, a little smallish charcoal and a sprinkling of fertiliser; soil sifted fine sets too hard. Newly potted caladiums do not require much water—just a sprinkle occasionally, gradually increasing as they commence to shoot. When in good growth, they can hardly have too much water, providing the drainage is good. If you have a nice warm corner where the leaves will not get too much of the afternoon sun, caladiums do well in the open ground, making fine plants and developing strong bulbs.

Dahlias will now require attention. Divide up old bulbs. In separating the tubers it is necessary to have an eye to each portion; this can best be obtained by cutting down through the old stem, a piece of which should be left on each bulb. After division, the tubers may be laid in the ground temporarily until the shoots appear, when they can be planted in their permanent positions. Have your stakes ready and place them in position before bulbs are planted; this often saves trouble.

Asters, salvias, and petunias may still be planted out from seed beds. They like a bright sunny position, as also do portulaca, amaranthus, celosia, cockscombs, and zinnias, whilst partially shaded positions are best for asters and balsams.

Remove all spent winter annuals, and prepare ground for abovementioned plants. Keep the hoe or small digging fork going, thus killing weeds and keeping the surface from caking.

TREATMENT FOR FISTULA.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

When a fistula on withers is forming, it is customary to apply a blister or hot fomentations. This on rare occasions appears to effect a cure, but in the majority of cases it hastens the swelling and brings it to a head. After it has broken, surgical treatment is required.

The next thing to find out is the direction and depth of the fistula. This is done by using a flexible probe, some 8 or 9 in. in length. Free drainage must now be given by opening along the full length of the probe, or, if thought advisable, an opening can be made at the lower part of the probe, and a seton of tape or other material passed through and tied on the outside. A seton keeps the wound open and assists in draining the cavity, but the first method of opening up is generally found more satisfactory. Both sides of the withers should be opened, if necessary, and any necrosed (dead) tissue removed. The top of withers should not be opened crossways —from side to side—because there is a ligament which runs along the middle line of shoulders from the head. If cut, it causes serious consequences.

The chief points to remember are:—Free drainage, the removal of all dead tissue, and the prevention of pockets where pus can accumulate.

The following lotion should be used every third day on the fistula after it has been opened up, until four applications have been applied:—

Corrosive sublimate	½ oz.
Methylated spirit	1 pint.

This is best applied by soaking some cotton wool or other absorbent material with the lotion, then packing the saturated cotton wool in the fistula. Knives, probes, &c., should be thoroughly disinfected before using, by placing them in boiling water or some disinfectant such as carbolic acid, condy's fluid, &c. Knives and other steel instruments should not be allowed to come in contact with the corrosive sublimate solution.

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the subjoined report (dated 16th September, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

Ayr District.—All the local mills are now crushing, and it is expected that the tonnages will be better than anticipated. The cane now being harvested from Pioneer and Kalamia (early in August) is of very fair density, some of the figures given to me being as follows:—

Plant H.Q. 426	18.67 c.c.s.
Plant Badila	17.40 c.c.s.
Ratoon Badila	17.20 c.c.s.
Plant S. Singapore	16.00 c.c.s.
Plant Q. 855	14.50 c.c.s.

The main varieties grown are Badila, H.Q.426, N.G.24, 24A, 24B, with a smaller proportion of Q.855, Q.813, Striped Singapore, Q.970, Q.903, Q.1121, Hybrid No. 1, 1900 Seedling, and B.208. A paddock of the lastnamed, belonging to Messrs. Land Bros., Rita Island, looks very healthy. Some splendi Hybrid No. 1 will also be cut on this farm. Upon Mr. Fraser Clark's farm at Jarvisfield, some fine Badila is being harvested. The soil upon this farm is mainly a very deep black loam, and of a wonderfully fertile nature.

Planting is still being carried out. The area of plant cane to be cut this year at Pioneer Mill is represented by about 2,890 acres, but this figure will certainly be exceeded for 1922.

At Kalamia about 2,700 acres of plant cane will be harvested, but so far this year only about 2,300 acres have been planted.

The density figures of the lastnamed mill were very high at the time of my visit, averaging about 16 c.c.s. At Pioneer some very fair Q.855 was being crushed, with a density of 14.55 c.c.s.

An innovation in these localities is the use of windmills for watering purposes. A number is now in use or in course of installation, and are optimistically regarded by users. With the introduction of a cheaper form of irrigation a very large area of good land could be profitably put under cane in this area.

The champion stool of cane at the Ayr Show was a splendid sample of H.Q. 426, grown by Mr. Geo. Taylor, whilst the first prize for best collection of three sticks each, of not more than twelve varieties, went to Mr. H. K. Kastener.

The varieties shown by him were Q.970, Q.903, Badila Seedling, N.G.24, N.G.24A, N.G.24B, H.Q.426, Q.1121, B.208, Q.855, Q.813, and Hybrid No. 1. These comprised a very fine exhibit, well displayed. Another fine exhibit was Messrs. Todd Brothers' three stocks of Plant Badila.

So far the Burdekin district has not suffered very much from pests. Borers were noticed in a few places, and grubs were noticed on the S.E. side of Plantation Creek.

Systematic and regular collection of beetles and grubs does much to minimise this evil.

Invicta Mill (*Haughton Sugar Company*).—The mill is now crushing, and a fair supply of good density cane is going through. So far it is hard to say how the earlier estimates of the crop will turn out. The principal varieties grown are H.Q. 426, Badila, Q.813, Q.855, N.G.24, 24B, and B.208.

In an earlier report I mentioned that Mr. Wright, a local grower, had previously suffered severely from grubs, and after planting the cane he is now cutting, treated it with 40 lb. of arsenic to the acre. He covered the plants with a little soil, used the arsenic on top, and later filled in the balance of the earth. He is now cutting this cane, and it looks far better than any in grubby areas adjoining.

Adjoining the Haughton River are several grub-infested farms, the owners of which are now employing the same measures to control the pest. Mr. Snow, a grower here, when replanting a block that was eaten out as very young plant cane

(although treated with some 40 lb. of arsenic) placed the new plants alongside of the old poisoned ones, and got an excellent strike. He thinks that the grubs were so "busy" with the old plants that they had no time for the new. At present, apart from the railway, all hauling is done per dray. With a tramway system in operation the cane supply would certainly be more assured.

After Ayr, Home Hill was visited. At the State Farm a section is being devoted to canegrowing, and a couple of crates of proven new varieties from the Mackay Experimental Station, and also some Tableland Badila, have been planted out. Irrigation experiments are also planned.

Inkerman Mill.—This mill is now in full swing, and promises to have a better tonnage than was expected earlier. The average density is fair, and steadily improving. About 5,320 acres of plant cane will be cut this year, but so far only about 4,400 acres are planted for 1922. The irrigation scheme is being put into operation as rapidly as possible, and its successful completion is anxiously awaited by the growers. Quite a number of new houses are being built.

In a former report I mentioned that Mrs. Hayward, a local grower, had given a block of land a very heavy dressing of filter press obtained from the mill. As a plant crop, the cane only went about 19 tons per acre, but the ratoon crop shows a splendid growth. One half of the block was planted with Badila and the balance with H.Q.426. The latter half looks very poor in comparison with the Badila.

Up the river from the mill Mr. D. Horwood is growing several varieties obtained from the Mackay Sugar Experiment Station on an unirrigated farm. He has Q.813, Q.855, Badila Seedling, Hybrid No. 1, Q.903, Q.1121, and one or two others. This year he is cutting some of it as first ratoons, and among the varieties Q.903 stands out for vigorous growth.

Herbert River District.—Two mills are in operation. The cane seems to be going in well and it is all very clean. The principal canes grown are Badila, H.Q.426, N.G.24, N.G.24A, N.G.24B, Innis, H.Q.409, and 1900 Seedling, but the two former are the most favoured varieties by far.

Due to continuous wet, lack of warmth, and also, to an extent, the presence of borers and grubs, the cane has not made as rapid a growth as it should have done, but, even so, a very fair tonnage will have been put through by the end of the season.

It is understood that permission to plant further areas has been granted by the company. Owing to causes mentioned above, a fair area of land has yet to be planted for 1922. A large number of the farmers are now using lime. A very fine class of earth lime can be obtained at about £2 8s. per ton locally, the using of which should soon repay the growers for their outlay. Green manuring and artificial fertilising are also coming into favour. Of the latter, artificial mixed manures, sulphate of ammonia, as well as meatworks manures, are used extensively.

A good deal of interest is being taken here in the work of the experimental stations. Mr. Enticnap and Mr. Wittrup, of Macnade, have just received a quantity of plants from the South Johnstone stations, and have distributed these among neighbouring growers. Mr. Wilkinson, the manager of Macnade, is also carrying out some very interesting experiments in connection with new cane varieties and at present is growing Korpi, Naremo, Oramboo, and H.Q.409.

Long Pocket and Hawkins Creek seem to have suffered more from grubs than other parts of the area. It will be remembered that Mr. F. S. Skinner, of Victoria, used a dressing of about 40 lb. of arsenic mixed with lime, on a two-months-old crop of plant cane, running it through a manure distributor alongside of the cane and covering over with a disc cultivator. Later, he dressed the crop with 2 lb. sulphate ammonia to the acre. Although the paddock had been previously eaten out by grubs, the cane got a good start and continued growing, and at time of writing promises to cut well. Adjoining blocks have suffered severely from grubs. In some paddocks borers were doing damage; "gumming" was also observed in many places.

It must be most strongly emphasised that the utmost care should be taken in selecting plants for seed from any area in which the presence of gum is noticed. If plants are taken from a healthy portion of an infected paddock, it is recommended that they be cut a day or so before using, kept under shelter from rains or heavy dew, and closely examined at both ends before planting; any showing the slightest trace of gum should be discarded.

Among the cane exhibits at the recent local show the most noticeable were some splendid stools of Badila exhibited by Messrs. Dawson Bros. and Messrs. E. and G. Venables. These were exceptionally good and fit to be shown anywhere.

On the Herbert a good deal of planting is done by hand, but among the machines used, Mr. Enticnap's combined driller and planter was noticed doing good work. It is drawn by four or five horses, worked by a man and a boy, and carried enough plants for an 18-chain drill; it is claimed to drill and plant nearly 6 acres per day. A manure distributor may also be worked at the same time.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (6th September, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"*Bundaberg.*—In the course of the month, Bundaberg district plantations have been inspected, including the canegrowing areas of Avondale, Miara, Bingera, Gin Gin and Maroondan.

"In the Bundaberg areas conditions are practically the same as set out in my last report. Cane is cutting satisfactorily, and the young plant crops are making good growth. Frosts have not been severe, but were sufficiently intense to curl the leaves of the cane on several farms, more particularly on the Woongarra side. The following particulars were supplied by Mr. Herbert Young, of Fairymead, regarding his observations during the frosty nights of the month:—

Yuban	Frosted
D.1135	Hardly touched
E.K.1	Badly frosted
E.K.28	Badly frosted
Q.1098	Frosted
D.10	Hardly touched
H.Q.77	Frosted
Q.470	Touched
Q.694	Touched
C.S.R.3	Badly frosted
Q.812 A	Hardly touched
N.G.81	Frosted
Reintroduced D.1135	Not touched
Q.822	Badly frosted
Shahjahanpur	Not touched

"An outstanding characteristic of the last-mentioned cane is its immunity from frost. This cane is growing rather thinly in the stick, but it is of good content and strikes and stools well. Careful selection of plants by the farmers may, in a few years, bring out the thickening of the individual canes.

"Black Innis is a variety which is being extensively planted this year in the Bundaberg district. It is an early maturing cane of fair sugar content. It is hardly a satisfactory cane in respect to the ratoons, however, and arrows freely about mid-autumn.

"Q.813 and 1900 Seedling are making a good showing on Woongarra and Barolin farms. The latter, however, is rather shyly striking, and is slowly establishing its root system. It is probable that in planting, if the farmer could cut five eye plants instead of three, and then destroy two of the eyes. they would surmount much of the slow-rooting difficulty. This is a surmise, however.

"A general note of satisfaction prevails at present among the growers, as the harvest is progressing without a hitch, and any industrial differences are being amicably settled.

"At Avondale and Miara satisfactory crops are being harvested. The frosts have slightly touched the cane, but the damage is negligible. Whenever there is a lull in cutting operations the farmers are busy preparing for the spring planting. The majority of the growers are planting early in an endeavour to get a twelve months' crop for next year. No disease is apparent. Practically all of the heavier soils on these areas would now be benefited by the use of lime.

"At Bucca, the growers are meeting with more success than has been the case for some years. The crops are well grown and healthy, and the cane that is being cut shows a fairly high percentage c.c.s., with good weight per acre. Long haulage is a drawback, but transport facilities have lately much improved. Varieties that appear to be giving the best returns are D.1135, and on the river banks 1900 Seedling. H.Q. 285 is making a good showing, and on present appearances it would be worth the growers' while to encourage this variety.

"The use of green manures is strongly recommended on Bucca highlands. The soil is deficient in humus.

"Conditions at Bingera are highly satisfactory this year. The cane is cutting with good density and weight per acre, and the different varieties going to the mill are crushing well. 1900 Seedling is giving about the best returns all round, although D.1135, B.156, Mahona, Badila, and Q.813 are canes that are giving good results.

"The cane at Bingera is free from disease—that is, as far as can be seen in the course of ordinary observation. On some areas there, leaf mottling is noticeable, but this ought not to be mistaken for striped leaf disease. This mottling is generally due to adverse soil conditions, and sometimes culminates in an entire yellowing of the

leaf. The symptoms of striped-leaf disease are irregular streaks of pallid green of unequal length and width, but elongated in the direction of the long axis of the leaf, on a background of normal green. This description would enable a farmer to generally distinguish the disease on, say, B.208.

"In the Gin Gin locality there is considerable agricultural activity. In addition to the harvesting, planting and ploughing are in progress, farmers in many cases breaking up land that has not been under cultivation for years. Losses through disease and insect pests are not severe this year, although on isolated patches the moth borer is active.

"On some of the farms the question of rotation of varieties might be considered by the growers. Gumming and striped-leaf disease are nurtured by a careless or indifferent attitude towards changing of varieties. In the Gin Gin district, probably those most profitably planted are D.1135, Black Innis, H.Q.285, and 1900 Seedling. All these varieties are doing well. At Maroondan, 1900 Seedling is cutting very satisfactorily and with good density. This cane could be grown here as a staple variety. B.156 is also a cane of good weight and sugar content at Maroondan. Malagache might also be profitably grown."

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 24.

WILD SAGE (*Salvia verbenaca*).

Description.—A strong-smelling perennial herb. Stems angular, clothed with rather rough hairs. Stems simple or dichotomously branched. Leaves somewhat ovate or more or less oblong in outline, the older and basal ones on long stalks, the upper ones sessile, the surface crinkled, and the edges toothed and crenulate. Flowers small, pale blue, in distinct whorls along a slender spike; each whorl of flowers subtended by two bracts. Fruiting calyx hairy, about four lines long, strongly ribbed. Nutlets ("seeds") at the bottom of the calyx tube, about one line long, nearly black.

Distribution.—A common English and European plant now naturalised in most temperate countries. In Queensland it is confined more or less to the Darling Downs.

Botanical Name.—*Salvia*, from Latin *salvo*, I save, on account of the common use of the plants as healing and curative herbs. *Verbanaca*, on account of its resemblance to the common Vervain (Verbena officinalis).

Common Names.—Wild Sage, Wild Clary, Eye Seed.

Uses.—Anne Pratte, in her work, "The Flowering Plants, Grasses, Sedges, and Ferns of Great Britain," where many notes on the uses of British plants are given, says of this one:—"Its seeds when placed in water yield a mucilage which when placed inside the eyelid for a few minutes envelops any particle of dust which may pain the eye; hence the name of the plant—Clary or Clear Eye." Our old herbalists considered it one of the most efficacious of herbs in any complaint of the eyes. A curious preparation of this plant seems to have been a favourite dish with our ancestors. Parkinson (an early English botanist) says:—"The leaves, taken dry and dipped into a batter made of the yolks of eggs, then flour and a little milk, then fried in butter till crisped, served for a dish of meate, acceptable with manie, unpleasant to none." Besides its uses in diseases of the eye, the Wild Clary is recommended for a variety of maladies.

Eradication.—So far as observed in Queensland, the Wild Sage is not a particularly aggressive weed, and calls for no special method of eradication.

Photo. by Dept. of Agriculture and Stock.]

Plate 58.—Wild Sage (*Salvia verbenaca*).

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

SCHOTIA BRACHYPETALA.

Natural Order Leguminosae.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—From "Flora Capensis," Vol. 2, 273, Harvey and Sonder, 1861. The genus, Schotia, was named by Jacquin in honour of a friend and travelling companion, R. Van Der Schot. There are several species, all being native of South Africa. Some are large shrubs or small trees, whilst others are fairly large trees. The specific name, *brachypetala*, alludes to the small, inconspicuous petals.

Description.—The species *Schotia brachypetala* was first described by Sonder (in Linn. Soc., Vol. 23, page 39) as a large shrub or small tree. The largest of three specimens in the Brisbane Botanic Gardens is between 20 and 25 ft. in height, with a spread of over 30 ft. The trunk is sturdy, bark dull brownish-grey, branches long, lower ones somewhat horizontal, that provide a good spreading habit. The young branches are tipped with dark-green bark, mottled with brownish spots and patches at and near the older branches.

Habitat.—Natal, in sheltered valleys where the soil is dry and rocky in the neighbourhood of Durban, also at an altitude of 2,000 ft. A very handsome tree when in full flower, well worth cultivating; it flowers in Brisbane in September and October.

Uses.—Maitland Woods, in "Natal Plants," p. 390, quotes Mr. Bazley as saying that the timber is very much like walnut, but closer in the grain. A splendid furniture wood, but bad to work, as the dust makes the eyes sore if it enters them. Takes a splendid polish; if unpolished gets much darker; is known as African Walnut.

Leaves alternate, pinnate, leaflets large ovate, oblong, or obovate, netted veined, in from four to five pairs, varying considerably in shape and size, the smallest being about ¾ in. long, ½ in. wide, the larger varying from 1½ to 2½ in. long, 1 to 1½ in. in width, sometimes tapering, sometimes truncate at base, always conspicuously, though not prominently, veined.

Flowers.—Panicles axillary and terminal, many-flowered; flowers pedicellate, calyx tube conical; petals, *very minute*, linear, hidden under the calyx lobes, stamens ten, monodelphous, ovary flattened elongated oval, about in centre of long stipe. The individual flowers, when open, are about 1½ in. in length, all parts of which are of a rich crimson colour. They are borne in dense clusters on both the larger and smaller branches on the inside of the tree; this gives it a somewhat unique appearance, and as many of the terminal shoots on outside of the tree carry foliage instead of flowers as the majority of trees do, the flowers are to some extent hidden. This prevents their being seen at any great distance from the tree, and a close view, practically under the tree, is necessary. From this position when in flower *Schotia brachyuctala* has a fine effect. The flowers appear to be full of honey, as they are a great attraction for large numbers of honey-eaters and other birds.

Pod.—These vary very much, often about 1½ in. in length, with a single seed; sometimes 2½ in. in length, with two seeds; and occasionally 5½ in. in length, with several seeds. They are from 1 to 1½ in. in width, seeds about ½ in. in length, not unlike horse beans, with a large yellow fleshy arillus attached to the hilum.

Propagation.—From seed. Although such a very free-flowering tree, it does not seed freely, only a small number being collected each year. All three specimens in the Gardens were raised from one packet of seed received from South Africa.

DEHORNING CATTLE.

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to smart, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day. With older animals a dehorning instrument must be used.

Photo. Dept. of Agriculture and Stock.]

PLATE 59.—"AFRICAN WALNUT" (*Schotia brachypetala*).

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 7.

KODA (*Ehretia acuminata*).

Common Names.—Koda, one of the Indian names; Churnwood (North Queensland). The latter name is not to be recommended, as it is more commonly applied to *Villaresia Moorei.*

Derivation.—*Ehretia,* after D. G. Ehret; *acuminata,* Lat., meaning pointed, from *acumino,* I sharpen (referring to the pointed leaves).

Description.—A large tree attaining a height of about 90 ft. and a barrel diameter of about 2½ ft. Barrel mostly channelled and angular in section, not deeply flanged at the base (at least in Southern Queensland "scrubs"). Bark grey or brown, rather fissured, especially on the ridges of the barrel; when cut, almost white, becoming brown on exposure; 3/16 in. thick on tree, with barrel diameter of 2 ft. 8 in. Sapwood white. Branchlets green, marked by a few white dots (lenticels), and containing a fair quantity of pith. Leaf stalks often grooved on the upper side, varying in length from ½ to 1¼ in. Leaves alternate, in outline egg-shaped or elliptical, varying a fair amount in breadth, margins toothed, lighter green on the underside than above, lateral nerves and netted veins prominent, especially on the underside; measurement of leaf blade, 3 to 6 in. long, varying from two to three times as long as broad. Flowers in bunches (panicles) at the ends of branchlets and in the forks of the upper leaves; panicles shorter or longer than the leaves. Individual flowers stalkless, measuring about ⅛ in. diameter when expanded, white and strongly scented. The lowermost part of the flower, the calyx, is cup-shaped, about 1/12 in. in length, and has five rounded lobes at its rim. On the inside of the calyx are the five petals united at the base in a short tube measuring about 1/12 in. The free part of each petal measures about 1/12 in. in length. Inserted on the inside of the tube of the petals are five bristle-like stamens nearly as long as the petals. The ovary (in centre of flower) is smooth and round, and is surmounted by a bristle-like style about 1/12 in. long, which is forked at the end. Fruit globular, ⅛ to ¼ in. in diameter, splitting vertically into two parts, each part containing two cells, and each cell containing one seed.

Flowering period.—September and October.

Distribution.—India, Japan, Philippine Islands, scrubs of the coast of Queensland (north and south), New South Wales as far south as Illawarra.—(Bentham).

Remarks.—In the field this tree somewhat resembles the Churnwood (*Villaresia Moorei*) and the Lignum Vitæ (*Vitex lignum-vitæ*). As a rule, the bark is less fissured or wrinkled than the former, and rougher than the latter.

Uses.—The timber could be used with advantage for many indoor purposes, such as fittings and cabinet-making. In India it is used for making scabbards, sword hilts, gun stocks, and is employed in building and agricultural implements. The unripe fruit is pickled; when ripe it is insipidly sweet, and is eaten.—(Brandis: "Forest Flora of North-west and Central India"). Professor E. H. Wilson informed us that the wood was preferred in the East above all others for carrying poles.

REFERENCES.

Ehretia acuminata, R. Brown. "Prodromus," page 497. Bentham: "Flora Australiensis," Vol. IV., page 387. F. M. Bailey: "Queensland Flora," Part IV., page 1038. Synonyms: *Ehretia serrata,* Roxb.; *Ehretia pyrifolia,* Don.; *Ehretia ovalifolia,* Hassk.

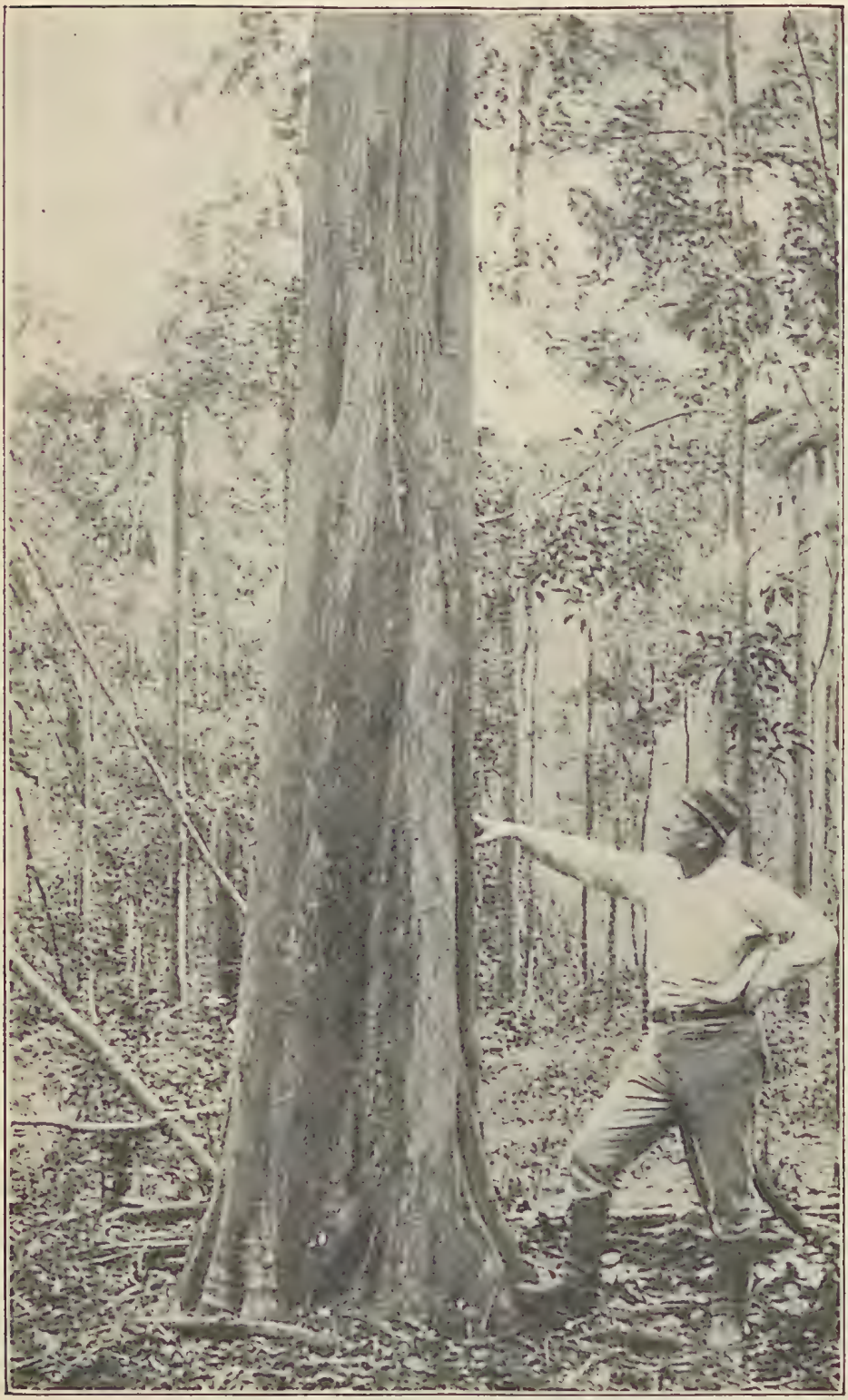


Photo. by the Authors.]

Plate 60.—Koda (*Ehretia acuminata*), Imbil Scrubs.

Plate 61.—Koda (*Ehretia acuminata*).

Photo. by Dept. of Agriculture and Stock.]

Entomology.

CANE-GRUB CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 9th September, 1921, from the Entomologist, Mr. Edmund Jarvis:—

"The present season having been very favourable for planting, some attention has been given to station improvements of a general character, which are best carried out during the winter months. Preparations for the approaching campaign against our notorious cane-grub are now under way, and a few preliminary notes regarding various plans of procedure that may interest growers will, in the future, be included in monthly reports.

"EXPERIMENTATION WITH DETERRENTS.

"It is proposed during the coming season to take up this line of control work, which, although previously touched upon by Mr. Tryon about twenty-five years ago, has not since been followed up or submitted to scientific investigation.

"The use of deterrents has long been advocated by economic entomologists as a method of coping with many kinds of insects, and of late years attempts have been made in other countries to employ this form of control against the white-grubs of root-eating scarabaeid beetles. Our choice of repellants, however, is naturally limited to substances that will not injure the young cane, can be handled without danger, and easily applied, and are inexpensive, or moderately so. Preferably, they should be of manurial value, and admit of application in a dry form.

"Mr. A. J. Draper has kindly given me permission to experiment in this connection on the Carrah Estate, where I have already selected a portion of a block of D.1135, planted last June, that is now about 18 in. high and looking well.

"I need hardly say that this form of control will be directed against the beetle itself, our object being to deter, if possible, the egg-laden female insect from entering the ground to oviposit, by previously rendering the surface-soil around the cane stools obnoxious in some way.

"COLLECTING CANE-BEETLES.

"As already pointed out in a previous report (1915) we must not lose sight of the fact that in problems such as that now facing us, entomologists have always considered that ideal methods are essentially those in which we succeed in capturing the female insects before they have had time to deposit eggs.

"The Cairns Cane Growers' Association published in the 'Post' this month a few suggestions offered by the writer regarding the future collecting of grubs and beetles, and invited canegrowers to freely criticise same and recount their experiences in this direction. Regulation No. 4 of these suggestions stated that grubs should be collected from cane lands only, or in the immediate vicinity of same, and beetles from within a radius of about a quarter of a mile from cane land. Apparently, some of our growers do not even yet realise that leading entomologists, as a whole, after working for over thirty years at the white-grub problem, assert that up to the present no better control method than that of systematic collecting has been discovered. We naturally recommend this method to growers, because it has stood the test of practical application, particularly in Europe and America.

"One of the latest examples of such work is reported from Mauritius, as follows:—'The number of Lachnosterna (cane-beetles) captured in 1919-1920 was under 31,000,000, as compared with over 71,000,000 in the previous year, and is the lowest since 1912-1913. The figures indicate that a control has been established in those areas in which the infestation originated; it is only in the more recently invaded part of the area that the number of beetles taken is still on the increase. This view is corroborated by the results of surveys for the larvæ.'

"In 1914 we collected 22 tons of beetles in the Cairns district, which represents 8,400,000 specimens, a number able to destroy 11,000 acres of cane, which, if producing an average, say, of 15 tons per acre, would mean a loss of 165,000 tons. Since the average annual loss in the Cairns district is estimated to be about 30,000 tons, it appears that the 22 tons of beetles captured in 1914 were capable of causing

injuries amounting to more than five times that of the whole of our annual loss from grub attack. Even if less than one-quarter of these beetles had oviposited in the canefields around which they were collected, we should have prevented the destruction of about 40,000 tons of cane, an amount exceeding that of our annual loss throughout the Cairns district. The above facts are mentioned here, because I hope to show later on that our most badly grub-eaten areas of cane land around Gordonvale have been gradually invaded by this pest, which first started its encroachments about the year 1897.

"With regard to the distance from cane from which beetles might be profitably collected, I think a quarter of a mile would be insufficient. Such limitation, however, would concentrate the work upon an area harbouring beetles that were very likely to trespass on adjoining cane land. If few collectors were employed, the plan would be advisable, while in the event of many hands being available it would be advantageous, I think, to work the feeding-trees further back.

"We know that the beetles will visit cane land half a mile away, but, unfortunately, we do not know whether they will fly twice or three times that distance in order to attack cane. Under normal climatic conditions a mile is probably the limit from which we need fear invasion, but should windy weather chance to occur during nightfall, as sometimes happens, whilst beetles are on the wing (from 8 to 9 p.m.) they are liable to fly to longer distances.

"TRAPPING BEETLES IN THE FIELD.

"In 1916, whilst at Gordonvale laboratory, I pointed out the desirability of capturing female beetles during the critical period of egg-laying, by means of light traps placed among the cane (see 'Australian Sugar Journal,' Vol. VII., page 903) and emphasised the fact that the beetles directly responsible for future trouble were those which, having managed to elude capture from feeding-trees, finally visited the canefields at night time in order to oviposit. Growers are advised to look up this special report. I hope, this season, to devise some new forms of light-traps, based on the design of that figured in the above-mentioned report, but of more simple construction, with which to follow up this line of control.

"PUPÆ OF CANE-BEETLES.

"On the 22nd instant it was found that pupæ of albohirtum had pupated at Greenhills at depths of 10 to 24 in. The soil was rather dry at 6 in. from the surface, but moist and very compact lower down.

"Two small grubs of an undetermined coleopterous insect were located at a depth of 30 in. Later, on the 24th instant, pupæ at Carrah, Meringa, were unearthed at depths varying from 8 to 14 in. The soil in this case was red volcanic, similar in mechanical composition to that tested by the writer on the same estate during October, 1915. In this class of land pupation apparently takes place at an average depth of about 11 in.

"Whilst at Hambledon last May it occurred to me that the control of the pupal stage of albohirtum had never been seriously attempted, and I was interested to find that Mr. A. L. Walker had given this matter consideration, and was of opinion that fumigation with bisulphide might prove beneficial in clearing up pupa-infested land before planting same. On certain areas of grub-eaten land at Meringa I have found pupæ of albohirtum to occur at the rate of about two per stool of cane. Assuming half these pupæ to produce female beetles, and allowing a loss of 20 per cent. of these from attacks of birds and other enemies, we shall find that the beetles arising from each acre of such infested land could produce 64,000 grubs, or enough to destroy 4 acres of cane.

"Preliminary experiments this month with bisulphide against the pupæ have demonstrated that specimens placed in cages of compact soil will succumb to fumigation. Field work will be carried out shortly, and it remains to be seen, primarily, whether the lining of puddled soil spread by the grub over the walls of its subterranean pupal chamber, prior to transformation, will prove to be impervious to the fumes of carbon bisulphide.

"CANE-GRUBS EATING ENGLISH POTATOES.

"One hears suggestions from time to time regarding the advisability of planting English potatoes on our most badly grub-eaten cane lands. In this connection it might be well to mention that some time back (June, 1919) my attention was drawn to what proved to be a rather interesting case of white-grub attack occurring in a vegetable garden at Kamma, near Cairns. The grubs in question, which were none other than those of our Greyback cane-beetle, were found to be hollowing out the

tubers of half-grown potatoes of the variety snowflake that had been planted in April on a plot of greyish clay loam soil, adjoining a block of sugar-cane. In some cases the tubers were nearly consumed, the large third-stage grubs of this pest being located right inside them.

"This fact helps to further substantiate views held by the writer regarding the dietary of grubs of albohirtum.

"PARASITE OF CANE-BORER.

"Steps are being taken to breed in considerable numbers the parasitic tachinid fly (*Ceromasia sphenophori*) for ultimate distribution in canefields at Gordonvale and Babinda, wherever the weevil-borer may be found to occur injuriously.

"It is proposed to obtain specimens needed for laboratory breeding from Babinda, but, if not available from that district, Mossman will be visited."

A NEW MOTH-PEST OF SUGAR-CANE AND MAIZE.

LEAF-EATING GRASS-WORM (*Laphygma exempta* Walk.)

By EDMUND JARVIS, Entomologist.

The presence of this insect was first notified by the writer at Meringa, near Cairns, on 18th February, 1920, on which date the caterpillars were more than half grown and causing very noticeable damage to cane leaves and young maize plants.

They swarmed literally in countless thousands over an area of about 100 acres, occurring, however, in greatest profusion on grass-covered roads and headlands.

A small patch of cane (D1135), that chanced to be weedy at the time when these moths were ovipositing, had suffered badly, large fragments having been cut out of the leaf-blades, which had in many cases been entirely devoured, leaving only the mid-rib.

Viewed as a whole from a little distance, the foliage of both maize and sugar-cane appeared ragged (fig. 3), and if the larval stage of this pest had been prolonged for another week or two the affected crops must have been eaten out.

However, three days later (21st February), the caterpillars were fully grown, and I then collected 200 specimens for experimental purposes—a mere fraction of those feeding on an area of less than a square chain. These were at once transferred to a couple of large breeding-cages (100 in each cage), and two days later had all gone under the soil to pupate.

The pupal stage occupied an interval of from seven to eleven days, the first moth making its appearance on 1st March, while during the next five days a total of forty-one moths emerged, viz., twenty-five males and sixteen females. From these 200 larvæ, only 20.50 per cent. arrived at the moth stage. A tachinid fly parasitised 33.50 per cent., and hymenopterous parasites 1 per cent., the remaining forty-five larvæ succumbing, presumably to some obscure bacterial disease.

The following notes from my diary may be of interest, as showing the dates and order in which these moths and parasites emerged:—

Insects Derived from Pupæ of 200 Larvæ of *Laphygma exempta;* Collected 21st February, 1920.

1st March ..	1 moth (male)	1
2nd March ..	13 moths (8 male, 5 females) ..	13
3rd March ..	21 moths (14 males, 7 females) ..	21
4th March ..	3 moths (1 male, 2 females) ..	3
4th March ..	2 tachinid parasites	2
4th March ..	1 ichneumon parasite	1
5th March ..	3 moths (1 male, 2 females) ..	3
6th March ..	7 tachinid parasites	7
7th March ..	4 tachinid parasites	4
8th March ..	20 tachinid parasites	20
9th March ..	10 tachinid parasites	10
10th March ..	18 tachinid parasites	18
12th March ..	6 tachinid parasites	6
17th March ..	1 ichneumon parasite	1
		110

The occurrence of this moth in Queensland canefields is of scientific interest, and has not, I believe, been previously recorded.

Dr. Turner was kind enough to identify the species, from specimens bred by the writer.

It would appear to take the place here of the notorious grass-worm (*Laphygma frugiperda* S. & A. that so often attacks cane and cereal crops in other parts of the world.

Laphygma exempta Walk. is a native of Africa, where it is known as the "swarming caterpillar," and is destructive to maize, millet, kaffir-corn, oats, wheat, barley, and potatoes.

DESCRIPTION OF CATERPILLAR (From Cane at Meringa: Figs. 2, 3, 4).

General colour dark-brown, with mid-dorsal, two sub-dorsal, and a band below spiracles pale-yellow. Spiracular-band, and area between yellow stripes light-brown or dull brownish-black, irrorated with short yellow lines, blotches, and dots. Prothoracic collar uniform brownish-black with three white stripes. Head reddish-brown; eyes lighter, and indistinctly mottled with yellow; a large white V-shaped mark on face, bordering inner edges of eyes. A large somewhat-raised yellow blotch close to posterior edge of each abdominal spiracle. Ventral surface of body light yellowish-green, dotted with white or brown on area between legs and lower spiracular band. Legs and claspers yellow, the latter with pinkish tips. Length of caterpillar about 25 mm. (1 inch).

Some of the larvæ noticed were grass-green in colour, with the above-mentioned markings and stripes pale-yellow.

HABITS OF THE CATERPILLAR.

Whilst crawling over bare ground its movements are quick and erratic. The larvæ feed openly in the sunshine on cane leaves, fully exposed to view, as many as a dozen caterpillars being found by the writer on a single small sucker about 1 ft. high. This habit distinguishes them at once from larvæ of the common "army-worm," *Cirphis unipuncta* Haw., which feed mostly at night, and hide during the day among the unfolding heart-leaves of the cane.

The caterpillars of *L. exempta*, when approached closely or touched, usually fall to the ground and remain motionless for a few seconds before crawling away.

DESCRIPTION OF THE PUPA.

Dark red-brown; the legs, wings, body segments, &c., outlined in blackish; hind margin of abdominal segments 4, 5, 6 reddish-black; frontal half (above spiracles) of segments 4 to 7 punctulate; end of anal segment obtuse, with two terminal short stout spines; stigmata dark, rather large, ovate, and prominent. Length of pupa about 15 mm. (five-eighths of an inch).

DESCRIPTION OF MOTH. (Bred from Cane at Meringa.)

Female.—Head and thorax dark grey ochraceous, the former with purple-black eyes crossed by a few golden lines; the latter tufted behind with long pinkish-grey scales. Abdomen light silvery-brown. Fore-wings dark grey ochraceous, two indistinct waved lines enclosing central area, three or four short longitudinal streaks near outer margin, and a row of about eight blotches on outer edge of wing deep-brown. Hind wings pilose, pale whitish-yellow shot with light rose-pink; the costal margin with darker scales; nervures, and the suffused edge of outer margin smoky-brown; fringes silvery, clouded basally with brown. Under surface of wings pale silvery-yellow; fore-wing inclined to light grey, hind wing suffused with pink. Legs dark-brown, distal ends of tarsal joints yellow. Length of body 13 mm. (½ in.); wing expanse of male 32 mm., of female 36 mm. (1⅜ in.).

Male.—Differs in having the fore-wings lighter grey, and conspicuously blotched with creamy suffusions, as shown in Fig. 1.

NATURAL ENEMIES OF *LAPHYGMA EXEMPTA* Walk.

Tachinid Parasite (undetermined)—

This insect closely resembles a common house-fly in size and general colouration, but differs from it in being clothed with the numerous stout bristles so characteristic of species of Tachinidæ.

Undoubtedly it is by far the most important of the parasites controlling *L. exempta*, and it is mainly through its instrumentality that the late broods of this noctuid are rendered insignificant.

On 3rd March, whilst moths were emerging freely in my breeding-cages (1st to 5th March), I visited the paddock from where the 200 caterpillars had been collected

on 21st February, fully expecting to find plenty of winged specimens, but was rather surprised to see only one moth resting on a maize leaf.

Three days later, when tachinid flies had appeared in the cages, the place was again visited, and upon arriving on the scene at 9.30 a.m. on a cloudy morning (heavy rain having fallen just before daybreak) I was interested to note the presence of an immense swarm of these useful parasites flying in leisurely and erratic manner close to the ground among grass-stems, weeds, &c., or settled on the leaves while copulating. The air resounded with a continuous hum, resembling the musical murmur produced by a swarm of bees on the wing, due to the buzzing of this countless multitude of flies; and one could not help wondering where so vast a host would ultimately breed, seeing that both caterpillars and moths of *L. exempta* were conspicuous by their absence.

Quite possibly this tachinid fly attacks larvæ of *Cirphis* and other related noctuids that occasionally invade our canefields in great numbers.

Hymenopterous Parasites—

1. *Metopius unifestratus* Mer. Description of male.—Body black, coarsely punctulate, and marked with sulphur-yellow as follows:—Face, first antennal joint, ten blotches of varying sizes on thorax, seven transverse abdominal broad bands diminishing in width towards anal segment, fore and mid-legs, and tarsal and distal portions of hind femora. Antennæ dark red-brown; wings smoky-brown, nervures dark-reddish. Length of body about half an inch.

Iphiaulax dubitorius Fabr. (male).—Body, an uniform light reddish-yellow; eyes, antennæ, distal ends of hind tibiæ, black. Wings pale-brown, the basal area and a central transverse band, yellow. Length of body about a quarter of an inch.

Both the above parasites are common here, and probably affect several kinds of lepidopterous caterpillars. The latter species was observed by the writer at Gordonvale in 1915 grossly infesting larvæ of a pyrale moth (Zinckenia), that were defoliating the weed known as "Fat-hen" (Chenopodium sp.) throughout a considerable area.

Predaceous Beetle—Ophonoides australis Dej.—Larvæ of this carabid beetle occurred in the affected area rather commonly, while the noctuid caterpillars were feeding, attacking principally those traversing the bare ground between cane stools, but also exploring the leaves at times in search of prey.

Directly one of these eminently predaceous larvæ encountered a caterpillar, it instantly buried its powerful cutting mandibles deeply in the body, near the head, and then simply hung on, while the unfortunate victim, in vain endeavouring to shake off its foe, twisted and rapidly rolled over and over convulsively.

Such struggles seldom lasted more than a minute, at the end of which time even large caterpillars seemed too weak to offer further resistance, and suffered the enemy to greedily imbibe their life-juices until its body had become greatly swollen and could hold no more.

This larvæ, which runs with agility and is exceedingly active and pugnacious, resides underground in small holes or sun-cracks.

Specimens whilst in captivity were fed on noctuid larvæ and pupæ, and soon pupated at the bottom of breeding-cages filled with damp soil.

The pupal condition during March (our hottest month) lasted only seven days; the maximum temperature at the time being about 87 deg. F.

Technical descriptions of the larval and pupal stages of this beetle need not be given here, but I may state that in general appearance the larva is uniformly black, of typical campodeoid form, and slightly exceeds half an inch in length. (See Fig. 5.)

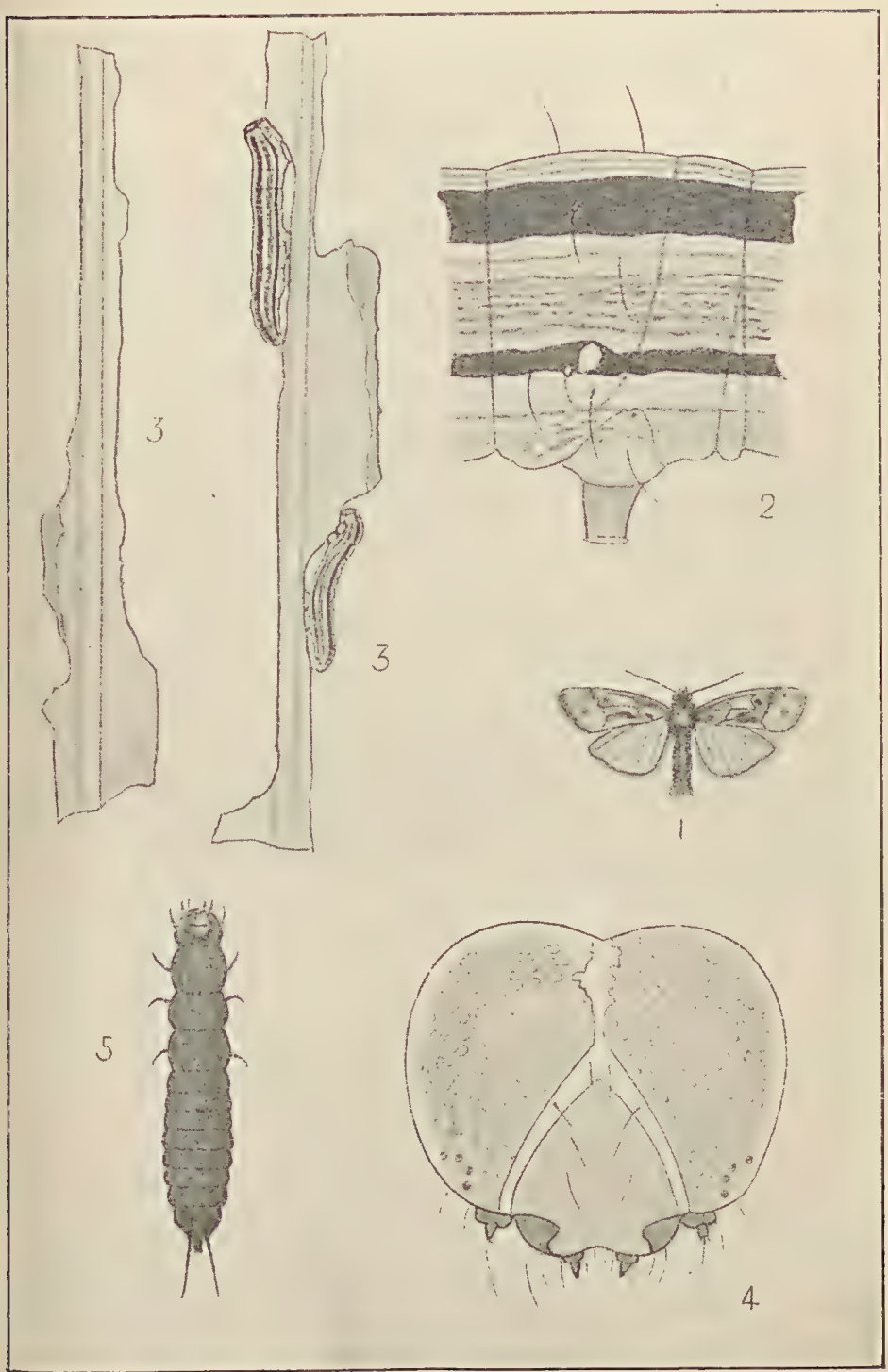
The beetle is about $\frac{5}{8}$ in. long, with prothorax and head shining green, and deeply punctured; wing-cases dark-brown, edged with green, and often suffused with iridescent pink, each elytron with eight parallel rows of punctures. Under surface of body and legs shining black; palpi and basal joints of antennæ reddish-brown.

This insect is common in most canefields, living under clods of soil, stones, &c.; and being, like many species of Carabidæ, most active during night time, and exceeding agile, usually escapes notice.

REMEDIAL MEASURES.

In the event of this moth-pest proving troublesome in the future, it may be as well to state that action should be taken directly the young caterpillars are first noticed.

The usual procedure is to spray the herbage lying between the swarm and the crop with some poisonous solution.



E. Jarvis, Del.

PLATE 62.—LEAF-EATING GRASS-WORM (*Laphygma exempta*, Walk.)

The following formula has been recommended by R. W. Jack, the Government Entomologist of Rhodesia:—

Arsenite of soda	1 lb.
Black sugar	8 lb.
Water	10 gall.

It is considered that when an attack is concentrated on a limited area it is best to use a spray consisting of arsenite of lime to which is added 3 lb. of black sugar to each 50 gall. of water.

DESCRIPTION OF PLATE.

(*All Drawings original.*)

Fig. 1.—Moth Pest of Sugar-cane (*Laphygma exempta* Walk., male, natural size).

Fig. 2.—Side view of an abdominal segment of caterpillar, showing disposition of bands, hairs, and light spot against spiracle (magnified).

Fig. 3.—Caterpillar of *L. exempta*, on portion of damaged cane leaf (natural size).

Fig. 4. Head of caterpillar (front view); magnified.

Fg. 5.—Larva of Carabid ground-beetle; predaceous on caterpillars of *L. exempta* (magnified about three times).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of August in the Agricultural Districts, together with Total Rainfalls during August, 1921 and 1920, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of Years' Records.	Aug., 1921.	Aug., 1920.		Aug.	No. of Years' Records.	Aug., 1921.	Aug., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·89	20	0·92	0·43					
Cairns	1·82	39	1·44	0·33	Nambour	2·06	25	1·63	1·56
Cardwell	1·34	49	1·38	3·93	Nanango	1·49	39	0·45	2 21
Cooktown	1·40	45	0·97	0·14	Rockhampton ...	1·02	34	2·66	1·52
Herberton	0·70	34	0·61	1·41	Woodford	1·92	34	1·07	1·01
Ingham	1·43	29	1·82	1·50					
Innisfail	5·41	40	3·74	2·07					
Mossman	1·40	13	0·79	1·49	*Darling Downs.*				
Townsville	0·48	50	0·16	1·62					
					Dalby	1·28	51	0·37	1·69
					Emu Vale	1·26	25	0·36	1·53
Central Coast.					Jimbour	1·34	33	0·94	1·69
					Miles	1·26	36	0·60	1·47
Ayr	0·56	34	0·41	2·53	Stanthorpe ...	1·92	48	0·18	2·02
Bowen	0·73	50	0·35	2·59	Toowoomba ...	1·81	49	0·84	1·89
Charters Towers ...	0·54	39	0·64	1·35	Warwick	1·56	34	0·50	1·84
Mackay	1·08	50	0·91	3·27					
Proserpine	1·31	18	3·73	3·57					
St. Lawrence ...	0·93	50	0·62	2·53	*Maranoa.*				
South Coast.					Roma	0·99	47	0·83	1·48
Biggenden	1·21	22	1·59	0·87					
Bundaberg	1·42	38	0·85	1·45	*State Farms, &c.*				
Brisbane	2·17	70	0·41	1·16					
Childers	1·30	26	1·45	1·42	Bungeworgorai ...	1·04	7	0·69	1·45
Crohamhurst ...	2·43	25	1·45	1·39	Gatton College ...	1·30	22	0·22	1·32
Esk	1·66	34	0·54	1·54	Gindie	0·81	22	1·05	1·32
Gayndah	1·27	50	0·59	1·41	Hermitage ...	1·54	15	0·27	2·06
Gympie	1·89	51	1·30	1·52	Kairi	1·19	7	...	1·82
Glasshouse M'tains	1·68	13	1·45	0·67	Sugar Experiment Station, Mackay	1·00	24	0·64	3·21
Kilkivan	1·61	42	1·05	1·90	Warren	1·14	7	1·31	2·11
Maryborough ...	1·80	50	1·02	1·90					

Note.—The averages have been compiled from official data during the periods indicated; but the totals for August this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Editorial Notes.

Efficiency in Dehydration.

Dehydration continues to hold the attention of fruitgrowers and, though interest does not slacken, a tendency to receive with caution accounts of successful processing and claims for the efficiency of various systems is very noticeable. The wisdom of closely investigating every claim advanced on behalf of any particular type of dehydrator, and analysing every factor making for efficient and economical production, is obvious to every thoughtful producer. A study of the industry, which in Queensland is still practically in embryo, at the present stage of its development will show that its future depends upon four primary factors—standardised production of the highest possible quality; efficient and economical production; an organisation as effective, at least, as those controlling fresh, canned, and sun-dried operations; and a liberal publicity and demonstration campaign. Mr. Arthur W. Christie, Instructor in Fruit Products, University of California, discusses at length the second of these factors in a paper read before the Second Dehydration Convention at Fresno, California, the proceedings of which have been published as a bulletin by the Californian Department of Agriculture. Californian experience and accounts of experiments are of especial value to Queensland fruitgrowers at this juncture, and the embarking upon any scheme or the acceptance of any particular system of dehydration should be preceded by the fullest investigation. It is not possible, in this issue, to completely review the paper referred to, but the subjoined extract, weighted as it is with sound sense, will indicate its general trend:—

"The past season afforded ample opportunity for careful study of the various types of dehydrators in operation, as well as the methods in vogue for handling of fruit before and after dehydration. As might be expected, some types of dehydrators and methods of operation showed decided superiority over others. In obtaining reliable data on the different systems for the dehydration of fruits, it was soon found impossible to accept, in many cases, the statements of manufacturers, owners, or operators. Reliance must be placed on carefully controlled tests made during the operation of the dehydrator under normal conditions. The dehydrator enthusiast seems closely related to the automobile fan who proudly informs you that his car climbs all hills on 'high,' can travel so many miles to the gallon of gasoline, and never was in the repair shop. Just as the condition of weather and roads, the load carried, and the skill of the driver all affect the performance of an automobile, so does the quantity and condition of fruit, the nature of the weather, and the experience of the operator, all affect the efficiency of a dehydrator. Although there is still much need for investigation, the data accumulated during the past season have materially clarified our ideas concerning proper construction and operation of dehydrators."

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Cassaba Seeds.

Through the generosity of two subscribers, who received Cassaba seeds through this Department for last season's sowing, we are now able to supply every applicant on our waiting list.

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Standardising, Advertising, Stabilising.

Queensland's great capacity for fruit production is every season amply proved, and the necessity of sound business organisation at the commercial end of the growers' enterprise becomes every day more evident. Standardisation of products, wide and judicious advertisement, and stabilisation of markets have become of first importance to producers generally, and more particularly to those engaged in the fruit industry. The fact that first-grade Queensland bananas are at present being marketed in the Southern cities as "Fiji bananas," notwithstanding that importations from Fiji have absolutely ceased, illustrates boldly, in one branch of primary industry alone, the clamant need of well-organised and effective publicity in respect to Queensland's products. Australians should naturally, through the bounty of Nature, be a fruit-eating people, and there exists a boundless field for intelligently directed co-operative effort under the three headings suggested. The producer knows what his land can

produce, conditions governing production, and generally how production may be improved. His present problem is how and where to find satisfactory markets for what he does grow. As an effort to add to general information on proved essentials of successful marketing, co-operative and otherwise, the first of a comprehensive series of articles on the selling side of primary industrial enterprise will appear in our next issue.

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Two Important Measures. The Regulation of Sugar Cane Prices Acts Amendment Bill and the Banana Industry Preservation Bill, two very important measures, were submitted to Parliament in the course of the month. Each, if finally approved by the legislature, will have far-reaching beneficial effect in two of our most important rural industries.

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The Cane Prices Acts Amendment Bill. "My sympathies are with the grower all the time, and this legislation was introduced purely and solely to protect the grower." The Minister for Agriculture, Hon. W. N. Gillies, indicated in this remark the main purpose of the Bill. From the viewpoint of national defence and the preservation of the White Australia ideal, canegrowing is the most important agricultural industry in the State, and any measure for its protection and advancement will meet with general approval. The Bill embodies the recommendations of a conference of representatives of the Australian Sugar Producers' Association, the United Cane Growers' Association, and the Chairman of the Central Sugar Cane Prices Board. The beneficial effects of the original 1915 Act and the Amending Act of 1917 are already well known. The canegrower has now a voice in fixing the price of his product, mill deliveries are regulated, the quality of the cane is determined, no indiscriminate deductions may be made, unjust penalties cannot be enforced, payment by analysis is, in nearly every instance, secured, knowledge of profitable varieties is ascertained as the result of an established system of analyses, mill allotments can be organised equitably, mediation in disputes is largely simplified, and compulsory crushing can, in the Minister's discretion, be enforced. The new Bill further safeguards the interests of all concerned in the industry. Perhaps the most important departure in the new measure is in Clause 17, which empowers growers and millers to enter into agreements for a term of years, with a safeguarding provision to the effect that 85 per cent. of the growers must ask for it, and it must be ratified by the Central Cane Prices Board. Power is also given the Central Board to exempt mills from crushing under certain circumstances. Clause 19 provides for appeals from decisions of police magistrates to the District Court judge who is chairman of the Central Board, or to another judge appointed for the purpose. Most of the other amendments clarify sections of the Act and make them more effective and renders their administration more efficient.

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Banana Industry Preservation Bill. "If there is a protective duty put on bananas it will have the effect of causing coloured labour to engage in the industry. The growers, therefore, have urged me to introduce legislation to keep the industry as 'white' as it is at the present time. . . . It is not the intention of the Government to interfere with any person who is engaged in the industry at the present time. It is desired to get this legislation on the statute-book as quickly as possible, because we have received information that Chinese are buying up land in Queensland and contemplate going in for banana cultivation. They are gradually going in for banana-growing in Queensland again; and just over the border, in New South Wales, the Chinese growers are increasing to an alarming extent." These remarks of the Minister for Agriculture, in introducing the Bill, epitomise its main purpose. Under the protection accorded by the Federal authorities banana-growing in Queensland must expand, and the Bill provides for the full engagement of white people in the industry. The banana is a valuable article of diet, and it is hoped and expected that, as a result of the increased tariff, a very important industry will be built up in this State. It is an industry returned soldiers can engage in, and the Bill provides for, as far as possible, keeping it "white." The most effective are Clauses 3 and 5. Clause 3 provides for the application of the dictation test; and Clause 5 gives power to make regulations, *inter alia*, for the granting of certificates to persons who have passed the dictation test and for the exemption from the Act of any person or class whom, for any reason, it is not considered necessary to examine.

General Notes.

PUBLICATIONS RECEIVED.

The International Review of the Science and Practice of Agriculture (Rome) for June surveys the world's activities in every branch of agriculture. In a reprint from the *Revista de Agricultura* the influence of fertilisers on the combustibility of tobacco is described. Results of Cuban experiments are tabulated, and, in the course of an account of the influence of each fertiliser used, the author (Moreno, Chemistry Chief, Agricultural Experiment Station, Cuba) draws the following conclusions:—(1) Double superphosphate, sulphate of ammonia, and potassium sulphate increase the combustibility of tobacco. (2) Calcium cyanimide should only be used in small amounts, because larger proportions produce toxic effects. (3) Sulphate is the best potassic fertiliser; the proportion can be increased with advantage to combustibility. (4) Manufactured tobaccos which burn the best are those of homogeneous composition, those with a small bulk and light colour being preferable.

The Boletin de Agricultura, Industria y Commercio (Guatemala), No. 2, 1921, contains an interesting description of the cultivation of vanila.

The Aberdeen Angus Review (June) has much information on "the premier beef breed of the world," and is of particular interest to cattlemen.

The American Bee Journal for July has some interesting notes on the control of the waxmoth, and on early beekeeping history.

Gardening and Country Life (South Africa) for September features a valuable article on chrysanthemum culture.

The Journal of the Department of Agriculture, Union of South Africa, for August continues a discussion on fodder and pasture grasses of the Union, with special reference to Rhodes grass. "The Castration of Animals with 'Burdizzo Pincers'" is another useful contribution.

The Rhodesia Agricultural Journal (August) has among its leading features, "Farm Butter Making," "Crop Rotation and Mixed Farming," and "Ticks Infesting Domestic Animals."

The Agricultural Gazette of New South Wales (September) continues its interesting series of reports on farmers' experimental plots. Its other features include the concluding article on "Producing Lucerne Hay under Irrigation Conditions" (F. G. Chomley and F. Chaffey), "An Affection of the Mouths of Sheep" (S. T. D. Symons), "The Value of Soil Analysis to the Farmer" (F. B. Guthrie and R. M. Petrie), "Methods of Maize Breeding for Increase of Yield" (H. Wenholz), and the concluding paper on "Co-operation for Farmers" (C. C. Crane).

The Handbook of Horticulture and Viticulture of Western Australia (3rd ed., 1921) by A. Despeissis, M.R.A.C., is brought out as a result of "the increasing demand and the fresh stimulus given to land settlement under the Scheme for the Repatriation of Returned Soldiers." It is a comprehensive and valuable work.

The Journal of the Department of Agriculture of South Australia (August) includes among its more important topics "National Schemes for the Improvement of Live Stock" (W. J. Colebatch).

The Tropical Agriculturist (Ceylon) for July contains a full account of the 1921 tractor trials in Ceylon, and some particulars of Adlay—a new grain. "Adlay is a coarse, annual grass, with hard, bead-like and shining grain. . . . An interesting plant in itself, it is of but little economic value."

The Hawaiian Forester and Agriculturist for June has an interesting note on the comparative value of split and round fencing posts. "The Forest Products Laboratory of the United States Department of Agriculture says that one will last as long as the other if the percentages of heartwood and sapwood are the same in both. If the percentage of sapwood is increased by splitting, the split post will be less durable, while if the percentage of heartwood is increased it will be more durable than the round one. . . . If the posts are to be treated with creosote or some other preservative, the round post is preferable to the split, because of the comparative ease with which the sapwood can be treated."

The Agricultural Gazette of Canada (July-August) has some interesting notes on the development of markets and inspection and grading of produce.

Safeguarding Farm Stock from Disease is an important bulletin by Max Henry, M.R.C.V.S., B.V.Sc., issued by the Department of Agriculture and Stock of New South Wales.

Answers to Correspondents.

BACON-CURING.

"Digger's Wife" (Mackay).—There are various methods of curing bacon, and the one for dry curing described hereunder is favoured by many:—

For every 100 lb. of meat take 3 lb. of coarse salt, 2 lb. of brown sugar, 1 lb. of allspice, 2 oz. saltpetre well powdered, and 1 oz. carbonate of soda; mix well together. If the other ingredients are not available, salt and sugar in equal parts, with a little saltpetre, will give good results. If possible, rub the meat first with 1 lb. of honey for every 100 lb. of meat. Then rub with about two-thirds of the preparation until it begins to stick well, which is generally in about seven minutes. The first two days' rubbing is the most important, and unless the meat cures then it is not in a suitable condition. After such rubbing, stack the meat in a tank, first putting a thin layer of salt at the bottom; a layer of sides is put on this with the rind downwards, then another layer is crossed on this, and so on until all the bacon has been put in. After twenty-four hours, turn and rub again, adding a little more of the unused mixture, after which turn and rub once in every forty-eight hours, using a little more of the mixture each time. Place the sides which are on the top to-day on the bottom to-morrow, and so on. After twenty-one days in pickle, it is ready for washing, drying, trimming, and smoking.

Place in water just warm enough to bear one's hand in, and then brush over with a dandy brush, which removes all fat, sugar, slime, &c. Then place in a tank with clean, cool water, for twenty-four hours. This takes the surplus salt out, and renders it mild-cured bacon. Afterwards hang up in a dry place where there is a good draught. If the days are fine and dry, with a slight breeze of wind, the bacon is generally sufficiently dry in about a week.

In trimming the bacon the sharp points of the rib-bones are sawn off, and the remaining part of the fore leg also sawn off level with the shoulder. The knife is then run over the belly part of the rib-bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance.

SMOKING.

It is then ready for the smoke-house. The walls of the house should be 12 feet high, and the smoke should be conducted to the bacon as cool as possible. Hang the meat close to the top, in rows about 6 inches apart. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour. Hardwood sawdust, damp maize-cobs, branches of eucalyptus free from all traces of gum, or stinkwort gathered with the sap in it and stored till dry, make excellent smoke. Light a small fire on the floor of the smoke-house, and place on it a few handfuls of sawdust. Then lay a sheet of galvanised iron on top, which will cause the fire to smoulder and produce smoke only. About 3 feet above this suspend another piece of galvanised iron, so as to prevent any heat from the fire reaching the bacon. After they leave the smoking-house, it is well to go over the hams and hands with lard and pollard and stop up any place that is likely to be attacked by flies. Finally, place the hams and hands in calico bags, taking care to tie them tightly at the top, and hang them from the ceiling until the weather gets warm. They can then be packed away in perfectly dry bran or sawdust, and should be taken out every six weeks and examined. If there should be any trace of mildew or sweating, it should be rubbed off with a cloth, and a little chaff added to the bran or sawdust. Keep as far as possible an even temperature. Too much heat will cause the fat to melt and turn musty, and if too damp it will sweat and decay. By curing and treating bacon in this way an article can be obtained which will always command a good price and will keep for many years.

ALGAROBA SEED.

W. Brotherton (Brothertonville, Gladstone) advises that the whole of his stock of algaroba seed has now been distributed.

CAROB BEAN.

J. W. Jackson (Fitzroy Farm, Etna Creek, Rockhampton) writes:—

"*Carob Bean.*—Some years ago I planted three seeds, from which I have got two trees. They grow all right here, but have not yet come into bearing. I had to transplant the bigger one, as it was growing too close to a citrus tree. Anderson and Co.'s (Sydney) catalogue gives particulars as to seed supplies and prices, which would interest intending growers."

TREE IDENTIFIED.

John Locke (Mackay).—The Government Botanist, Mr. C. T. White, F.L.S., to whom your specimen was submitted, advises as follows:—

"The specimen sent is *Grevillea Hilliana*, a tree closely allied to *Grevillea robusta*, as suggested. It is a native of the scrub country of Eastern Australia, from the northern parts of New South Wales to about the Bowen district. In New South Wales it sometimes goes under the name of the White Yiel Yiel, but I have not heard a vernacular applied to it in Queensland. The specific name *Hilliana* is in honour of Walter Hill, the first Government Botanist of Queensland and Director of the Brisbane Botanic Gardens."

RATIONS FOR PIGS.

H. B. Barnes (Caboolture).—

(1.) Examples of rations for pig-feeding will be published in next issue.

(2.) *Weaners.*—Note remarks in paragraph 2, page 4, of "Pig Raising in Queensland," by E. Graham and H. C. Quodling; also on page 22, under the heading "Weaners and Slips." Weaners of the age mentioned, 9 weeks, can be reared without skim milk, provided the food is easily digestible, of a suitable nature, and given more in the form of gruel by boiling pollard and maize-meal with approved waste food from the house. Better results, however, will be attained by adhering to advice given in respect to the use of skimmed milk and dairy by-products.

MARKET INFORMATION—BANANA INDUSTRY—SUGAR INDUSTRY.

C. H. D. P. (Spring Hollow, Yeppoon).—

MARKET INFORMATION.

A monthly publication is seldom recognised as a suitable medium for market information as, to be of value, it must, obviously, be both accurate and timely. The Journal cannot reasonably be expected to assume the functions of a daily or weekly newspaper.

BANANA INDUSTRY.

The imposition of the duty on imported bananas was primarily due to the action of the Queensland Department of Agriculture and Stock, and the Bill now before Parliament, introduced by the Hon. W. N. Gillies, Minister for Agriculture, and which provides for the preservation of the banana industry and other incidental purposes, is a natural corollary of the further action taken by the Federal authorities.

SUGAR INDUSTRY.

Sugar-growing is the most important agricultural industry in the State, upwards of £15,000,000 being invested in it, and it is not considered that too much space is being devoted to it in the Journal.

SCOTCH THISTLE (CARDUUS LANCEOLATA).

Inquirer—

The Director of Agriculture, Mr. H. C. Quodling, advises as follows:—

"Thistles should be cut off below the surface of the ground to kill them outright. No doubt quantities of seed have been deposited on the ground, and these will commence to grow at the first favourable opportunity. If it is possible to mow these thistles regularly they can be temporarily kept in check, and in this way the grass will be given a chance to flourish. Thistles usually choke themselves out in the course of two or three seasons, but in this case they will have effected a great deal of damage in the meantime."

COTTON SEED AS A STOCK FOOD.—TOBACCO AND LUCERNE SEED.

COTTON SEED AS A STOCK FOOD.

G.H.B. (Glass House Mountains)—

If you refer to the remarks on the value of cotton seed as stock food in the July issue, you will note that no mention is made of it as pig feed. Though beneficial to cattle and sheep, cotton seed should not be fed to pigs. Cotton seed crushing in an ordinary corncracker is necessarily a comparatively slow process, owing to its tendency to clog in the machine. An adjustment of the rollers might relieve the difficulty. Hard maize crushed with the cotton seed would help to keep the rollers free.

TOBACCO AND LUCERNE SEED.

Tobacco seed is obtainable from the Department of Agriculture and Stock at 3s. 6d. per oz., postage paid. Varieties on hand are:—*Cigar*—Connecticut, Cuban, and Connecticut Havana; *Pipe and Cigarette*—Broadleaf Gooch, Blue Pryor, and Sweet Orinoco. Lucerne seed is obtainable from any seedsman.

TREATMENT FOR DOGS, FOALS, AND CALVES AFFECTED WITH "SCRUB" TICKS.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Scrub ticks cause a great deal of trouble to stockowners in certain districts, with a large percentage of mortalities. It has been stated that these ticks do not harm the animals during the first four days' attachment, so it is recommended that where scrub ticks are prevalent, valuable animals should be thoroughly examined every second or third day.

It has been proved that trypan blue, injected under the skin, is a specific for this disease in the dog; the paralysis soon improves, and in a few days the animal thoroughly recovers. One dose of the trypan blue is usually sufficient.

A 2 per cent. solution (about 9 grains to a fluid oz. of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel, in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The hypodermic syringe and needle, before being used, should be placed in a dish containing cold water, then placed over the fire and the water boiled for some ten minutes. This thoroughly sterilizes the syringe and needle, which is now ready to use when the solution to be injected has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder. The skin in these positions being loose, a fold is easily caught up by the finger of the left hand, whilst the needle is inserted with the right hand. It is advisable to clip off the hair and disinfect the spot chosen before introducing the needle.

A dose for dogs, according to age and size, varies from 1 to 5 drachms or 1 to 5 teaspoonfuls.

The dose for calves and foals, according to age and size, varies from ½ oz. to 2½ oz., or 1 to 5 tablespoonfuls.

Farm and Garden Notes for November.

Field.—Unless untoward weather or other conditions interfere with field operations during the latter part of October, most of the wheat in the Maranoa will be harvested by the first of this month, and harvesting operations extended to the South-Western Line, and then on to the Downs.

Farmers are commencing to realise that quick maturing wheats which possess a degree of rust resistence are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plant. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kafir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghum have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COAST DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools beings overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely-ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account we allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young pawpaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first

appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit, it appears to be covered with a grey dust, and if the fruit is examined with a good lens it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early-ripening peaches or other fruits that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruits profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully and, on its first appearance in a district, all ripening fruits should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	September.		October.		November.		December.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·34	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5·26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6·13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5·40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6·22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queenslan New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
2 Sept.	●	New Moon	1	33	p.m.
9 „	☾	First Quarter	1	30	p.m.
17 „	○	Full Moon	5	20	p.m.
25 „	☽	Last Quarter	7	18	a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1 Oct.	●	New Moon	10	26	p.m.
9 „	☾	First Quarter	6	12	a.m.
17 „	○	Full Moon	9	0	a.m.
24 „	☽	Last Quarter	2	32	p.m.
31 „	●	New Moon	9	39	a.m.

Apogee on 11th at 8·51 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1	54	a.m.
15 „	○	Full Moon	11	39	p.m.
22 „	☽	Last Quarter	9	41	p.m.
29 „	●	New Moon	11	26	p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11	20	p.m.
15 „	○	Full Moon	12	50	p.m.
22 „	☽	Last Quarter	5	54	a.m.
29 „	●	New Moon	3	39	p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

NOTES ON AGRICULTURAL DEVELOPMENT, CENTRAL DISTRICT.

BY G. B. BROOKS, Instructor in Agriculture.

Occasionally one hears a remark to the effect that conditions in the Central District are generally unfavourable for farming, and that agriculture is not likely to become an important industry. Fortunately, this view is invariably given expression to by those who, in regard to the conditions obtaining, have little or no knowledge.

Should evidence be required of the development that has recently taken place, one has only to peruse a map dating back a few years, when it will be found that our closely settled districts, such as Barmoya, Mount Larcom, Dawson Valley, Ridgelands, Marlborough, Boyne Valley, Targinnie, and Rosslyn are not placed.

It must be admitted that the settlers in some of the districts mentioned have had to face some adversity but it must also be remembered that during recent years the seasons along the eastern seaboard of Australia have been rather erratic, and the man who embarked on the land with little or no capital naturally had a hard row to hoe. Moreover, it is a well-recognised fact that newly populated districts are invariably handicapped through a large proportion of the settlers having had no previous knowledge of agriculture; also that it takes a district, even given the most favourable seasons, a few years to gain momentum. Several of the abovementioned sub-districts have reached what may be termed the well-to-do stage; others are about to enter, while a few which have just recently been put on the map are still in the pioneering stages.

Experienced farmers in the respective localities have already disproved the statement that these closely populated areas are outside the safe limit for successful crop production, and have demonstrated in no uncertain manner that conditions of soil and climate are equally favourable to those obtaining in other portions of the State. Those tests have not been carried out on garden patches, but on a fairly extensive scale. I can, for example, name a farmer who has, during a single year, raised over 100 acres of English potatoes; another, 500 acres of maize; while in another district there is a single patch of 100 acres of cotton being planted.

Dairying as an industry is certainly destined to assume a position of very great importance in the near future. During recent years tremendous areas of scrub have disappeared, and in its place are waving fields of Rhodes grass.

A feature invariably overlooked in connection with dairying in Central Queensland is the absence of extremes in temperature. It is, therefore, infinitely easier to keep animals in good condition and returns from the factory at a higher level than would be the case were the herds exposed to heat waves during the summer or cold westerly winds during the winter months. The fact that Central Queensland has carried off champion honours in the District competitions at the National Show, Brisbane, both in regard to agricultural products and fruit, and that it so far has been the only district in Queensland to enter the lists against those of the mother State, at the Sydney Royal, is an indication that its agricultural possibilities cannot altogether be ignored.

There are several important industries in process of development in Central Queensland that will eventually have a direct bearing on agricultural expansion by providing local markets for farm produce. Enormous deposits of high-quality metalliferous ores, coal, marble, limestone, and other minerals must eventually support a huge industrial population. The famous Mount Morgan gold and copper mine exists within its boundaries; the whole district is well served by railways; and on its coast is one of the finest harbours on the Australian seaboard.

These notes are the first of a descriptive series on the agricultural areas and possibilities of this well-endowed district, and the order in which localities are mentioned has no relation to their importance.

WOWAN DISTRICT.

The closely settled area of country extending from Dululu to Rannes, drained by the Dee and Don Rivers, has, by its proximity to the Dawson Valley Railway Line, been erroneously named "the Dawson Valley district." The Dawson River, by the way, is some 40 miles distant.

Before the advent of the railway, Dundee (now Deeford), rather prettily situated on the banks of the Dee, was the only township in those parts, but, having failed to find favour with the railway surveyor—no doubt on account of adjacent low-lying country subject to flooding—the neighbouring railway station, Wowan (native name for scrub turkey), became the centre.

When it is considered that only a few years ago the district was portion of a cattle run, the progress made has been remarkable. In Wowan most of the activities essential to an agricultural district are represented.

Physical Characteristics.—The greater portion of the district is of a gently undulating character. It is bounded on the west by the Dee Ranges, and watered by two rivers—the Dee and the Don. There are also several creeks, the most important being Alma, Pheasant, and Callide. The Dee River was brought before public notice a few years ago by the sensational finding of large nuggets of gold near its source. Towards the south-eastern portion of the district there are two fairly large stretches of water—Lake Caroline and Lake Victoria.

Although not generally known, there are large quantities of limestone in the district, the deposit running parallel with the Dee Ranges, while lime in a granular or earthy condition is also to be found in immense quantities. Samples secured from various localities and submitted for analysis show calcium to be present equal to 60 per cent. carbonate of lime. Marble has also been located in places, but the extent of the deposit has not been determined.

Climatic Conditions.—The average annual rainfall for the district is in the neighbourhood of 30 inches. Several comparatively dry seasons, which, by the way, were more severe in other parts of the State, were experienced subsequent to the opening of the land for settlement. This put a very heavy strain on the financial resources of the settlers, most of whom were depending entirely on the maize crop as a means of support. During the first year very extensive areas of scrub were cut down, mostly adjacent to the main roads. This was all practically burned off and planted with maize about the same date. Unfortunately, when at the critical stage, a hot, dry spell adversely affected the entire crop. Better fortune was experienced in following seasons.

Soils.—The Wowan district is particularly fortunate in its soils, both in regard to quality and the large proportion of land that is available for cultivation; in fact, on a great many farms practically every inch is fit for the plough.

To the east of the Dee, where the country was originally timbered with brigalow, the soil is a brown friable loam of excellent quality. Adjacent to Alma Creek there are large stretches of alluvial forest flats on which are to be found growing lucerne, maize, cotton, and other crops.

PLATE 63.—FODDER DEMONSTRATION PLOTS ON FARM OF A. E. G. BARNARD, WOWAN. VARIETY, PATRIOT WHEAT.

PLATE 64.—WOWAN, DAWSON VALLEY: A RAPIDLY GROWING DAIRYING CENTRE.

PLATE 65.—FODDER DEMONSTRATION PLOTS, A. E. G. BARNARD, WOWAN. VARIETY, FLORENCE WHEAT.

PLATE 66.—PROMISING CROP OF BROWNELL POTATOES, TAKEN SEVEN WEEKS AFTER PLANTING. GROWN BY E. C. VALLIS, DOUBLE CREEK, DEEFORD.

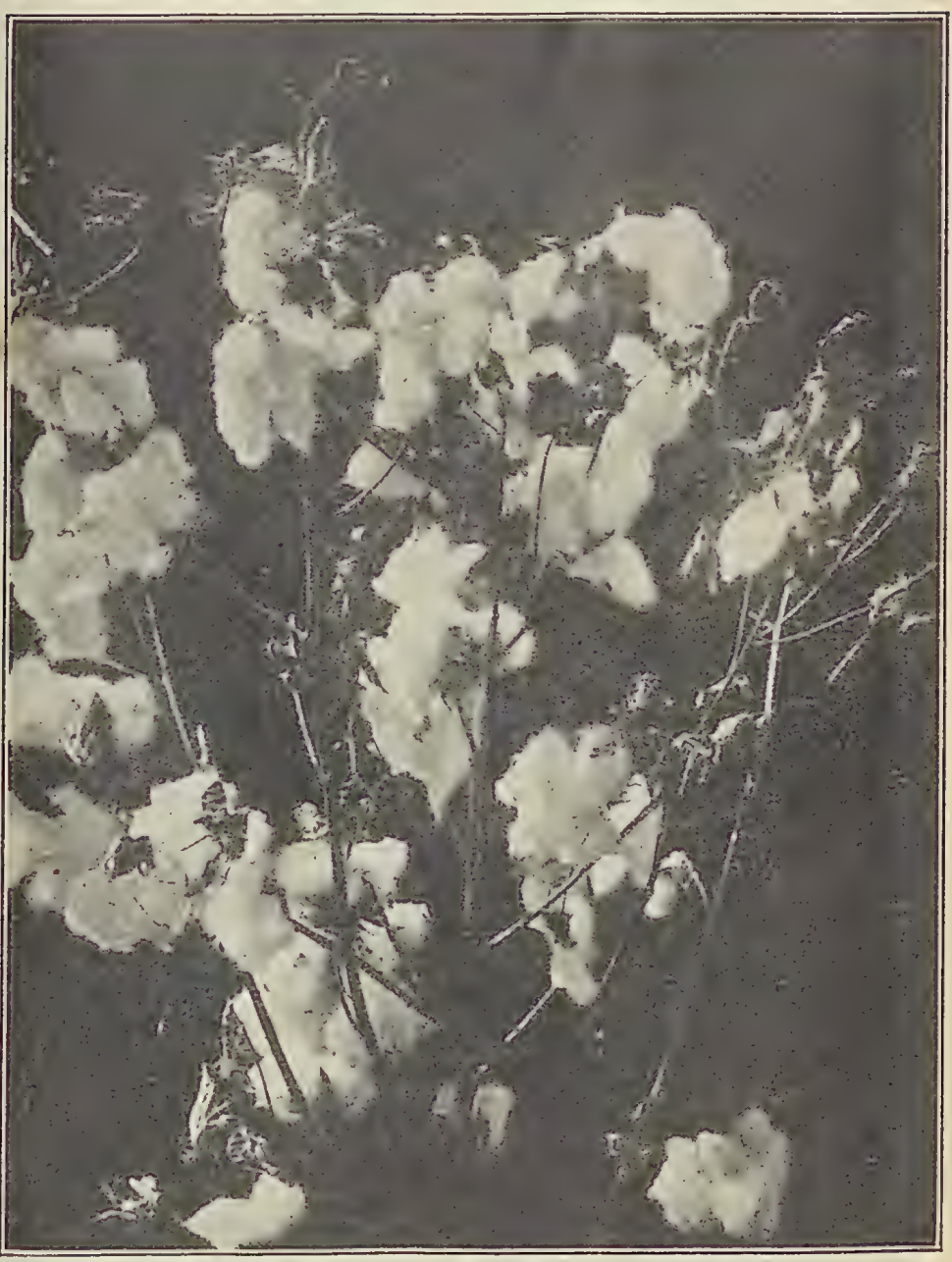

PLATE 67.—A PROLIFIC COTTON PLANT, DURANGO VARIETY, GROWN IN WOWAN DISTRICT

Between the Dee River and the railway line, and extending from Dululu to the junction of the Don, the soil is mostly of an alluvial nature. From the railway to the Dee Ranges, which includes the Pheasant Creek district, the country is of a more variable character, and is made up principally of brigalow and softwood scrubs, interspersed with patches of forest, timbered mainly with gum, ironbark, and bloodwood.

To the south of the Don, where it junctions with the Dee at almost right angles, there is an immense stretch, consisting of thousands of acres of rich alluvial flat country, large portions of which are excellently adapted for the raising of lucerne, potatoes, and other valuable products. The distance to the railway, from 10 to 12 miles, has no doubt retarded development; also the fact that there are low portions which, during heavy floods, would probably be subject to inundation.

Lines of Development.—With the majority of settlers the chief objective is dairying. The procedure therefore has been the falling of the scrub, cropping with maize, and seeding down in Rhodes grass. That those interested are not lacking in enterprise is shown by the erection of a co-operative butter factory at Wowan. This industry has been somewhat handicapped through the difficulty in obtaining, owing to the distance from old-established dairying centres, the type of dairy animal desired. Stock from high-producing herds are, however, gradually being brought into the district.

Hitherto the principal crop raised has been maize, but the guaranteed price of 5½d. per lb. for cotton in the seed has been an incentive to increased production of that product. Last season the area under cotton was approximately 230 acres, the return from which brought into the district over £4,300 in hard cash. This gives an average yield per acre of 800 lb., valued at £18 10s. The returns given may be considered very satisfactory, more particularly when, in many instances areas were planted too late in the season to ensure a full crop.

There has been a considerable increase in the area sown for the 1921-2 crop, a rough estimate being 2,000 acres. Last season there were several farmers who had patches of about 30 acres. This season it is expected that the 100-acre mark will be passed.

Departmental Activities.—The Department of Agriculture, through its instructors, are giving every assistance to the man on the land. Plots have been established in several localities for the purpose of demonstrating the best kinds of fodder crops to grow in order to provide herds with winter feed. Practical demonstrations have been given in stack-silage making, also in the raising of suitable crops for fodder conservation.

The farmers are practically co-operating with the Department in carrying out various tests, the results obtained being considered of very great value.

The accompanying illustrations show the fine results obtained from the present season's fodder crops grown on the farm of Mr. A. E. G. Barnard.

An asset to the district is the valuable stud shorthorn herd located at Calliungal, and owned by Mr. J. L. Wilson. Mr. Wilson evidently recognises the importance of the fact that judicious feeding must go hand in hand with successful breeding. Judging by the provision made in regard to fodder conservation, his motto appears to be "One paddock one silo," for on two of his properties—Calliungal and Calliope—he has erected nine silos. Dairymen please note.

DIRECTIONS FOR PLANTING UPLAND COTTON.

Cosmopolitan Character of Plant.—Under favourable climatic conditions, cotton will thrive on a great variety of soils.

A well-drained soil and a sheltered situation should be chosen.

Drought-resistant Habit.—The plant is a deep rooter, and naturally drought-resistant once it is firmly established, but responds to good cultivation and will return heavier crops where the surface soil is thoroughly prepared beforehand and moisture stored up in the subsoil and conserved by regular cultivation for the use of the growing crop.

Well-prepared Land Essential.—Land that is ploughed and cross-ploughed (not necessarily deep), say to a depth of 6 or 7 in., should be worked up to a good tilth on the surface prior to the seed being sown. In this way germination is assisted and a supply of plant-food made readily available.

A Good Crop for Scrub Land.—Cotton is a suitable crop for, and thrives well on, naturally burnt-off scrub land, the seed being sown in "hills" amongst the stumps and logs. Two or three seeds are sown to each "hill," spaced about 2 ft. apart.

Thinning should be carried out when the plants reach a height of from 6 to 8 in., the strongest plant being allowed to remain.

Weeds should be destroyed by hand cultivation and the surface soil surrounding the plants kept in a loose, friable condition.

Sowing Seed on Cultivated Land.—Five or six pounds are sufficient for an acre when care is exercised in planting.

Where a single-horse maize drill is used for planting the seed, very light furrows may be run out 4 ft. apart with the plough, and the seed drilled in the furrows, or a marker may be used, marking three rows at a time. Prompt harrowing immediately after these operations is necessary.

Rapid and economical planting is assured by the use of a two-row maize planter.

Distances between Plants in the Row.—A good average space between young growing plants is from 8 to 10 in. It is necessary, however, to thin these out when they are several inches high, leaving one strong plant at intervals of from 20 to 24 in.

Wide planting of upland cotton induces the formation of "vegetative" (woody) branches, to the detriment of the "flowering" (bud-bearing) branches, and a consequent reduction in its cropping capacity.

Treatment of Seed.—Owing to the short fluffy fibres adhering to the seed, it must be treated prior to attempting to pass it through a drill. Puddled clay or flour paste is commonly used for this purpose. Seed is dipped, in small quantities, into a vessel containing either of the above mixtures, the best consistency for which is readily ascertainable by a little practice. That treated with puddled clay should be rolled by hand on a sieve or other suitable surface, and the seeds made up to resemble small marbles, which must be allowed to dry out in the sun; when drying out, careful handling is necessary.

The flour-paste-treated seed is dipped into the prepared paste and drained and dried so that the seeds do not stick together.

Time to Plant.—Other things being favourable, the time for planting seed varies according to climatic conditions ruling in any particular district, and may be carried out as soon as danger from frost is over—up to October, and, in some localities, November.

Period of Maturity.—The crop takes from four to four and a-half months to mature. As the whole of the bolls do not ripen at once, it is necessary to go through the crop every few days and gather those which are thoroughly dry and have fully exposed their cotton.

Harvesting.—Picking should not commence until the dew has completely dried off the cotton.

The strictest care should be exercised to keep the seed cotton free from leaves, sticks, dirt, or foreign matter of any description, and stained or discoloured cotton should not be mixed with the clean, sound, marketable sample.

Clean bags or bales must be used for the reception of the crop. These should be legibly branded before despatch to their destination.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

By H. I. JENSEN, D.Sc. (Syd.).

(Continued from October Journal.)

We find prickly-pear in various places along the foreshores of Deception Bay, where seaspray is carried over the land, and back from the sea over areas which have been only recently salt marshes or arms of the sea. The pear does not spread back over the leached soils of the higher lands, because these soils contain no salts. With a view of testing this explanation, the writer collected three type soils—

No. 460.—Typical brigalow soil with dense pear spreading fast, 40 miles north of Roma-Durham Downs road.

No. 461.—Typical belah soil, with some pear, healthy but not spreading as fast as in the brigalow. Same road, 30 miles north of Roma.

No. 462.—Typical box soil. Some pear, but not healthy. 35 miles north-west of Roma, on Cornwall Station.

Mr. E. H. Gurney, Chemist of the Queensland Department of Agriculture and Stock, kindly made an analysis of the water-soluble constituents of these three soils.

The result was most interesting and instructive, and show that valuable information may be gained by following this line of research.

—	No. 460.	No. 461.	No. 462.
	Per cent.	Per cent.	Per cent.
Soluble silica	·0068	·0036	·0068
Sodium chloride (common salt)	·0140	·0083	·0068
Sodium sulphate (white alkali)	·0085	·0122	Nil
Sodium carbonate (black alkali)	·0252	·0134	Nil
Magnesium chloride	Nil	Nil	·0012
Magnesium sulphate	Nil	Nil	Nil
Magnesium carbonate	·0012	·0017	·0004
Calcium chloride	Nil	Nil	Nil
Calcium sulphate (gypsum)	Nil	Nil	·0046
Calcium carbonate	·0264	·0286	·0054
	·0821	·0675	·0252
Total soluble	·1021	·1200	·0444
Organic matter, &c.	·0200	·1525	·0192

It may be stated that No. 460 was a calcareous shale soil—very heavy clay. No. 461 was a calcareous sandstone soil—a light friable chocolate loam. No. 462 was a somewhat stiff shale soil, from aluminous rather than calcareous shale.

It is interesting to note that the brigalow scrub was remarkably high in common salt and both white and black alkali, which is exactly what was expected.

The very alkaline and saline brigalow country is pure brigalow–prickly-pear scrub, with very little admixture of other vegetation. Where the country is less alkaline we get with the brigalow some belah (*Casuarina lepidophloia*), box (*Eucalyptus populifolia*), wilga (*Geijira parviflora*), sandalwood (*Eremophila Mitchelli*), whitewood (*Atalaya hemiglauca*), bottle-tree (*Sterculia rupestris*), currajong (*Sterculia diversifolia*), orange (*Canthium buxifolium* and *Canthium oleifolium*), pomegranate or orange (*Capparis Mitchelli*), mulpup (*Capparis lasciantha*), myall (*Acacia pendula*), red ash (*Alphistonia excelsa*), emu apple (*Owenia acidula*), buttercup bush (*Cassia eremophila*), and numerous other things less distinctive.

Brigalow-Belah Country.—This is country in which brigalow and belah occur together in almost equal proportions. The soil is heavy, but not as heavy as those previously discussed. It has a clay subsoil and overlies arenaceous shales rich in lime. It can be successfully cultivated and should suit some varieties of cereals, which, no doubt, the Agricultural Department can recommend.

The vegetation is much the same as that given for the less-alkaline brigalow soils. Wilga, myall, sandalwood, emu apple, and bottle trees occur in the scrubs.

Belah Country.—Where the belah forms scrubs by itself, the soil is usually a sandy loam with a porous subsoil overlying sandstone formation rich in lime; in fact, calcareous sandstone. Belts of this rock are frequent in the Walloon formations between Roma and Injune. These soils are of excellent mechanical texture, rich in plant-food and easy to clear, and rank easily with the river alluvials as the best agricultural soils in the area. As Mr. Gurney's water-soluble analyses show, the type belah soil is not excessively charged with alkali.

These soils should grow good fruit orchards, and should be fine wheat soils. They are also, when cleared, excellent grass lands.

Sandalwood Country (Sandalwood—*Eremophila Mitchelli*).—The soil is usually loamy and of a chocolate colour. It is fair to good in mineral plant-food, but it has a clay subsoil which makes it favourable for the cultivation of cereals, but not too good for fruit trees. The subsoil is very impervious; hence this class of country is good for dam and tank construction. It is well grassed.

Associated with sandalwood we usually get some box and silverleaf ironbark (*Eucalyptus melanophloia*), the latter where a stony formation gets close to the

surface. The other associated trees are myall (*Acacia pendula*), wilga (*Geijera parviflora*), whitewood (*Atalaya hemiglauca*), emu apple (*Owenia acidula*), and orange (*Capparis Mitchelli*). The soil is free from excessive salinity, but has a high absorptive power for water, and hence gets very boggy after rain.

Box (*Eucalyptus populifolia, poplar box*) *Country.*—The soil on which the poplar box holds sway is usually a grey clay soil, fair in mineral plant-food, but rather too heavy for cultivation and generally inclined to be sour. It holds water well, but has poor capillary powers, differing in that respect from the sandalwood country.

Associated with box we may get, on the one hand, a sprinkling of the belah scrub timbers or of the sandalwood country timbers, or, on the other hand, silver-leaved ironbark if the stone is near the surface.

Sometimes we get a fair amount of poplar box on felspathic sandstone country, where, however, it is subordinate to pine, Moreton Bay ash (*Eucalyptus tesselaris*), sugar-gum (*Angophora lanccolata*), and tumbledown gum (*Eucalyptus dealbata*). This class of country is poor in lime, but typical box country is fair in lime.

Sandalwood with box country is usual on shale and felspathic sandstones with fair lime content.

Silverleaf (*Eucalyptus melanophloia*) *Country.*—This ironbark south of the Dividing Range is usually characteristic of soils of fair quality but not deep. The rock is near the surface. It is country which has a good mechanical composition, but owing to the soil being shallow it is liable to dry out very quickly in dry weather. The grass is good in good seasons, but bad in bad seasons. We get the silverleaf mainly on felspathic and calcareous sandstone, while pine dominates on silicious sandstones. The commonest associate of silverleaf is poplar box.

Pine Country (*Pine—Callitris glauca*).—Pine is characteristic of the most silicious of sandy soils. It is poor country, very deficient in mineral plant-food though good in mechanical texture. Pine country is found on silicious sandstones. It will grow fair wheat crops in favourable seasons for a year or two, but soon gets exhausted and then needs heavy manuring. The grasses are poor or useless. Spinifex is often the main grass.

While pure pine scrubs occur on the driest of sandy areas, wherever moisture conditions are better or the soil is a little more clayey, we get associated with pine silverleaf ironbark, Moreton Bay ash, sugar gum, crooked gum (*E. dealbata*), apple (*Angophora intermedia*), yellow bloodwood (*Eucalyptus trachyphloia*), quinine (*Petalostigma quadriloculare*), dogwood (*Jacksonia scoparia*), cherry (*Exocarpus cupressiformis*), grevilleas, hakeas, wattles (most widespread of which is *Acacia Cunninghamii*), pear (*Xylometon pyriforme*), and rosemary (*Cassinia levis*). Amongst other plants collected on poor sandy country on the Walloon belt, between Roma and Injune, are *Hoovea longipes, Eucalyptus decorticans, Acacia doratoxylon, Acacia decora, Acacia decurrens, Acacia macradenia, Acacia podolyriæfolia, Casuarina inophloia, Lysicarpus termifolius, Dodonea viscosa, Cassia eremophila*, &c. This great retinue of shrubs occurs on the dry pine areas and on the stringybark areas in sandstone country where the soil is shallow and dry. Stringybark (*Eucalyptus acmenioides*) is found only on hills and tablelands in sandstone together with pine, woolly oak (*Casuarina inophloia*), *Acacia Bancrofti*, and budgeroo (*Lysicarpus ternaifolius*). In wet places or on very deep sandy soils with high capillary power we get *Moreton Bay Ash-Sugar Gum Country.*—This country is poor in plant-food but grows good crops for a few years, when fertilisers become essential. In this class of country we have open forest. The chief associate timber is tumbledown gum. Sugar gum and Moreton Bay ash are invariably on sandstone formation. Along creeks and near springs the apple (*Angophora intermedia*) and red gum (*Eucalyptus tereticornis*) accompany the abovementioned timbers.

The Basaltic Lands around Mount Hutton.—These yield rich chocolate loams and, in ill-drained places on tablelands, black soils. They grow excellent grass and herbage and, where the soil is chocolate and the country not too steep, should yield excellent agricultural land. The area of suitable land is, however, not great.

The timbers present on the basalt are chiefly box (*Eucalyptus hemiphloia*), coolibah (*E. microtheca*), and silverleaf ironbark (*E. melanophloia*).

Gilgai Country occurs in brigalow and brigalow-belah scrubs. It is rich in plant-food, but too alkaline and stiff, as well as too uneven, to be suited for cultivation. The origin of gilgais is supposed to be due to the high expansion and contraction of the soil on wetting and drying.

BOILED COTTON SEED AS STOCK FOOD.

By E. Graham, Chief Dairy Expert.

Owing to the increased attention that is now being given to the growing of cotton by farmers in this State, there is a correspondingly larger amount of cotton seed available each year, as feed for stock, and it is of more than passing importance that simple and inexpensive methods of preparing the cotton seed before use in feeding to stock should be understood generally.

A great deal of valuable information concerning the utilisation of cotton seed for stock-feeding purposes has been supplied by officers of this Department, and the same has been available to dairymen interested, through the medium of the Journal, from time to time. While it is widely recognised that cotton seed is comparatively high in nutriment, as a fodder, it has failed to grow into general use as a feed for dairy stock, partially on account of the difficulty attendant to the removal, by means of crushing or other device, of the hornlike substance of the shell which covers the kernel of the seed. However, as the result of experience which has been gained by the feeding of cotton seed, after boiling, to stock, the indications are that the crushing of the seeds and the removal of the shells are not really imperative.

For some time past it has been the practice of several dairymen to feed boiled cotton seed to the dairy cows, and the results to date go to show that the boiled cotton seed is quite satisfactory for use as a concentrate for feeding in conjunction with other fodders, such as white straw chaff, sorghum, cow-cane, &c.

The method of boiling the seed is as follows:—Place sufficient of the seed to meet the requirements of the herd for a day in a copper or other receptacle, and add enough water to cover the seed; then bring to a boil. The boiling should be continued for fifteen to twenty minutes, and by this time it will be found that the shells have been reduced to a sufficiently soft condition to allow of the kernels of the seed being pressed out of the shells with comparative ease. It is noticeable, also, that the shells, by boiling, lose a great deal of their original toughness, and it is highly possible, too, that the shells in this state are more readily digestible.

As the seeds have a tendency to float on water, it is advisable to cover the top of the receptacle in which the boiling is carried out; when this is done it is unnecessary to stir the seeds during boiling.

If boiled in an open vessel, it is best to press the seeds into the boiling water rather than to stir them, because harsh agitation of the seeds when the shells are softened causes the shells to break and the contents to be lost as feed.

After boiling is completed the superfluous water may be run off, and the seed is then ready for feeding purposes.

The boiled seeds do not ferment readily; consequently ample seed may be boiled at one time to fill the requirements for the day. It is estimated that 2 lb. of the boiled seed is approximately equivalent to 1 lb. of the dry seed.

Animals partaking of the cotton seed are healthy in appearance, and no difficulty is experienced in getting cows to take cotton seed in a boiled form.

OSTEOMALAGIA OR SOFT BONE.

When animals are suffering from this disease, which is very prevalent in some districts of Queensland (particularly on the North Coast Line), it is generally due to an insufficiency of lime in the soil.

The Chief Inspector of Stock (A. H. Cory, M.R.C.V.S.) recommends that the following lick be given in the manner described:—

Bone meal	1 lb.
Carbonate of iron	4 oz.
Gentian	4 oz.
Common salt	8 oz.
Foenugreek	4 oz.

One or two tablespoonfuls to be allowed each animal twice daily in food.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR SEPTEMBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ..	31 July, 1921	1,480	3·7	60·93	
Miss Security ...	,, ...	20 Aug. ,,	1,502	3·6	60·08	
Iron Plate	Jersey ...	12 July ,,	1,015	4·9	58·45	
Affection of Gowrie Park	Ayrshire ...	8 Aug. ,,	1,223	3·9	53·31	
Bellona	,, ...	26 June ,,	1,159	3·9	50·48	
College Mignon ...	Jersey ...	7 July ,,	809	5·1	48·47	
Prim	Holstein ...	9 Mar. ,,	1,178	3·5	45·41	
Hedges Madge ...	,, ..	15 Aug. ,,	1,171	3·5	45·32	
Miss Betty ...	Jersey ...	7 July ,,	789	4·1	36·23	
College Cold Iron	,, ...	10 Mar. ,,	685	4·3	32·95	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	630	4·7	32·60	
Yarraview Village Belle	,, ...	6 Aug. ,,	543	5·1	32·53	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	693	3·7	28·52	
Glow VI.	Guernsey ...	28 Aug. ,,	654	3·9	28·38	
College Cobalt ...	Jersey ...	6 Jan. ,,	510	4·8	27·59	
Netherton Belle ...	Ayrshire ...	30 Oct., 1920	570	4·3	27·48	
Magnet's Leda ...	Jersey ...	6 Oct. ,,	516	4·6	26·76	
Charming Damsel	Ayrshire ...	12 May, 1921	598	3·8	25·40	
Miss Fearless ...	,, ..	26 May ,,	615	3·7	25·20	
Wattle Blossom ...	Guernsey ...	21 May ,,	428	5·0	25·14	
Rosine	Ayrshire ...	19 Jan. ,,	591	3·8	25·01	
Comedienne ...	Jersey ...	26 Nov., 1920	460	4·8	24·88	
Dawn of Warragaburra	,, ...	15 Oct. ,,	461	4·7	24·38	
Royal Mistress ...	Ayrshire ...	19 Mar., 1921	571	3·7	23·46	
Lilia	,, ...	3 April ,,	523	4·0	23·35	
Confidence... ...	,, ...	8 Feb. ,,	508	4·1	23·25	
Hedges Dutchmaid	Holstein ...	26 May ,,	618	3·4	23·24	
Confidante ...	Ayrshire ...	12 May ,,	479	4.3	23·09	
College Ma Petite	Jersey ...	23 Dec., 1920	374	5·0	21·97	
Thornton Fairetta	,, .	15 Mar., 1921	360	5·1	21·57	
Snowflake	Shorthorn...	21 Dec., 1920	476	4·0	21·35	
College Grandeur	Jersey ...	29 Dec., ,,	420	4·5	21·24	

EXAMPLES OF RATIONS FOR PIG-FEEDING.

BY E. H. GURNEY AND V. S. RAWSON.

Standard ration as given by Kellner for pigs 100 lb. weight:—Dry matter, 3·6; digestible protein, ·45; digestible fat, ·09; starch equivalent, 3·20.

To compound a ration giving approximately these quantities of substances, it is necessary to first look up the analysis of the foodstuffs and to calculate on these figures.

For instance, a ration consisting of maize, skim milk, lucerne, and swedes:—

	PARTS PER HUNDRED.			
	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
Maize	87	6·8	4·3	81·8
Skim milk	10	3·8	0·2	7·6
Green lucerne	19	2·7	0·4	8·7
Swedes	12	0·3	..	7·5
RATION No. I.—LB. OF SUBSTANCES.				
3 lb. maize	2·61	·20	·13	2·45
5 lb. skim milk (½-gallon)	·50	·19	·01	·38
1 lb. green lucerne	·19	·03	..	·09
4 lb. swede turnips	·48	·01	..	·30
	3·78	·43	·14	3·22
RATION No. II.—FURTHER EXAMPLES.				
3 lb. barley	2·58	·18	·06	2·16
5 lb. skim milk (½-gallon)	·50	·19	·01	·38
1 lb. sweet potatoes	·31	..	..	·24
3 lb. green lucerne	·57	·08	·01	·26
	3·96	·45	·08	3·04
RATION No. III.				
3 lb. barley	2·58	·18	·06	2·16
5 lb. skim milk	·50	·19	·01	·38
3 lb. mangel	·36	..	..	·19
3 lb. lucerne	·57	·08	·01	·26
	4·01	·45	·08	2·99
RATION No. IV.				
1¾ lb. barley	1·50	·11	·03	1·26
1½ lb. sorghum (seed)	1·27	·06	·04	1·02
5 lb. skim milk	·50	·19	·01	·38
3 lb. green lucerne	·57	·08	·01	·26
	3·84	·44	·09	2·92
RATION No. V.				
2 lb. pollard	1·78	·20	·06	1·36
5 lb. skim milk	·50	·19	·01	·38
2 lb. green lucerne	·38	·06	·01	·18
5 lb. sweet potatoes	1·55	..	..	1·20
	4·21	·45	·08	3·12
RATION No. VI.				
3 lb. barley	2·58	·18	·06	2·16
5 lb. buttermilk	·50	·19	·05	·46
3 lb. cowpeas	·60	·06	·01	·28
1 lb. English potatoes	·25	..	..	·19
	3·93	·43	·12	3·09

	PARTS PER HUNDRED.			
	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
RATION No. VII.				
3 lb. barley	2·58	·18	·06	2·16
5 lb. buttermilk	·50	·19	·05	·46
3 lb. cowpeas	·60	·06	·01	·28
3 lb. mangels	·36	..	..	·19
	4·04	·43	·12	3·09
RATION No. VIII.				
1¾ lb. barley	1·50	·11	·06	1·26
1½ lb. sorghum (seed)	1·27	·06	·04	1·02
5 lb. buttermilk	·50	·19	·05	·46
3 lb. green lucerne	·57	·08	·01	·26
	3·84	·44	·16	3·00
RATION No. IX.				
2¼ lb. wheat	1·96	·20	·03	1·61
5 lb. skim milk	·50	·19	·01	·38
2 lb. green lucerne	·38	·06	·01	·18
4 lb. sweet potatoes	1·24	..	..	·96
	4·08	·45	·05	3·13
RATION No. X.				
3 lb. wheat	2·74	·27	·04	2·14
4 lb. skim milk	·40	·15	·01	·31
2 lb. rape	·28	·02	·02	·14
12 lb. pumpkin	·96	·04	·02	·48
	4·38	·48	·09	3·07
RATION No. XI.				
2¼ lb. maize	1·96	·16	·10	1·84
5 lb. skim milk	·50	·19	·01	·38
4 lb. green lucerne	·76	·11	·02	·35
1 lb. molasses	·76	..	..	·48
	3·98	·46	·13	3·05

EXAMPLES OF CALCULATING RATIONS.

Referring to Ration I. we see that 100 lb. of maize contain 87 lb. of dry matter; therefore 3 lb. contain $\frac{3}{100} \times \frac{87}{1}$ = lb. 2·61 lb.

Similarly 100 lb. of maize contain—

6·8 lb. of digestible protein,
4·3 lb. of digestible fat,
81·8 lb. of starch equivalent.

Hence 3 lb. of maize contain—

$\frac{6{\cdot}8 \times 3}{100}$ lb. of digestible protein = ·204 lb.

$\frac{4{\cdot}3 \times 3}{100}$ lb. of digestible fat = ·129 lb.

$\frac{81{\cdot}8 \times 3}{100}$ lb. of starch equivalent = 2·454 lb.

Having obtained these figures in a similar way for all the foodstuffs to be supplied, we are able to calculate therefrom, by addition, the sum total of our food substances.

Let it be presumed, then, one is considering the compounding of a ration containing the same fodders, but in different quantities, *e.g.*, 2 lb. of maize, 5 lb. of skim milk, 5 lb. of green lucerne, and 2 lb. of swede turnips. The calculation is made on a similar basis to that mentioned above.

	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
2 lb. maize	1·74	·14	·09	1·64
5 lb. (½-gallon) skim milk	·50	·19	·01	·38
5 lb. green lucerne	·95	·14	·02	·44
2 lb. swede turnips	·24	·01	..	·15
	3·43	·48	·12	2·61

The foregoing ration is nearly correct in the dry matter, but there is too high an amount of digestible protein (thus causing a waste); also the amount of starch equivalent is much too low. This latter is to be remedied without increasing the amount of digestible protein, and at the same time only slightly increasing the amount of dry matter. It is proposed to do this by the addition of 1 lb. of maize.

1 lb. of maize contains—

·87 lb. of dry matter,
·068 lb. of digestible protein,
·043 lb. of fat, and
·82 lb of starch equivalent,

and thus adding ·87 lb. of dry matter, and as 4 lb. of green lucerne contain ·72 lb. of dry matter, it is suggested to deduct this amount of green lucerne, which contains, besides, ·11 lb. of digestible protein and ·35 lb. of starch equivalent.

	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
3 lb. maize	2·61	·20	·13	2·45
5 lb. (½-gallon) skim milk	·50	·19	·01	·38
1 lb. green lucerne	·19	·03	..	·09
2 lb. swede turnips	·24	·01	..	·15
	3·54	·43	·14	3·07

This ration is nearly correct, though slightly low throughout, with the exception of digestible fat, which is of minor importance. This ration may be adjusted, if desired, by adding a small amount of any of the three fodders which are most convenient.

For instance—

	Dry Matter.	Digestible Protein.	Digestible Fat.	Starch Equivalent.
(A)—				
Ration	3·54	·43	·14	3·07
2 lb. swedes	·24	·01	..	·15
	3·78	·44	·14	3·22
(B)—				
Ration	3·54	·43	·14	3·07
¼-lb. maize	·22	·02	·01	·20
	3·76	·45	·15	3·27
(C)—				
Ration	3·54	·43	·14	3·07
1 lb. green lucerne	·19	·03	..	·09
	3·73	·46	·14	3·16

For fattening purposes (A) might be slightly the best, as (B) is inclined to be wasteful, and (C) is slightly low in starch equivalent. There is, however, very little to choose between them on the score of actual nutrition.

KELLNER'S RATION FOR FEEDING OF PIGS.

TABLE SHOWING DAILY REQUIREMENTS IN FOOD (IN POUNDS) PER 1,000 lb. LIVE WEIGHT.

Age in Months.	Live Weight per Head.	Dry Matter in total Ration.	Digestible Substances		
			Protein.	Fat.	Starch equivalent.
	lb.	lb.	lb.	lb.	lb.
(*a*) Breeding Stock—					
2—3	44	44	6·2	1·0	33·8
3—5	88	36	4·0	0·8	27·3
5—6	120	32	3·0	0·5	23·2
6—9	175	28	2·3	0·3	20·2
9—12	265	25	1·7	0·2	15·8
(*b*) Fattening Stock—					
2—3	44	44	6·2	1·0	33·8
3—5	110	36	4·5	0·9	32·0
5—6	145	32	3·5	0·7	26·5
6—9	200	28	3·0	0·5	24·5
9—12	285	25	2·4	0·3	19·8

COMPOSITION OF FOODS.

Green Fodder.	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 lb.				Starch equivalent per 100 lb.	Lbs. of Food to give.	
		Protein.	Crude Fat.	Carbohydrates or Nitrog. Free Extract.	Crude Fibre.		0·45 lb. of Protein.	3·2 lb. of Starch equivalent
Grasses—								
Barley (young) ..	19	1·5	0·3	6·4	3·1	9·6	30	33
Buffalo grass ..	22	1·2	0·4	9·0	2·9	12·0	37	27
Couch grass ..	26	2·4	0·3	7·3	5·3	12·5	19	26
Maize	29	1·2	0·4	9·8	6·4	14·5	37	22
Indian Cane ..	23	0·7	0·2	7·9	6·0	12·0	64	27
Oats (in green head)	21	1·0	0·4	7·5	3·6	11·0	45	29
**Panicum muticum* ..	27	1·4	0·3	7·3	6·0	12·0	32	27
Paspalum dilatatum	25	1·3	0·4	7·2	6·4	13·0	35	25
Prairie grass ..	23	2·1	0·6	6·1	4·5	10·5	21	31
Rhodes grass ..	29	1·0	0·4	8·6	7·7	15·0	45	21
Rye	24	1·4	0·5	7·0	4·9	11·3	32	28
*Sorghum	29	1·2	0·5	11·3	5·4	15·0	37	21
Sugar-cane (stalk) ..	29	1·0	0·5	14·0	6·5	18·5	45	17
Sugar-cane tops ..	27	1·1	0·6	8·9	6·7	14·0	41	23
Legumes—								
Beans (various) ..	15	1·5	0·5	4·1	1·6	7·1	30	45
Cowpea	20	1·9	0·5	6·2	2·9	9·5	24	34
Lucerne (flower) ..	24	1·5	0·4	5·7	3·5	8·4	30	38
Lucerne (young) ..	19	2·7	0·4	4·7	2·0	8·7	17	37
Peas	15	1·9	0·3	3·2	2·3	6·6	24	49
Peas (field)	17	1·6	0·3	3·7	3·0	6·8	28	47
Vetches (in flower)	17	1·4	0·3	4·9	2·3	7·5	32	43

* The Fodders marked contain hydrocyanic acid and prussic acid yielding glucosides, and must therefore be used with caution.

COMPOSITION OF FOODS—*continued.*

Green Fodders.	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 lb.				Starch equivalent per 100 lb.	Lbs. of Food to give.	
		Protein.	Crude Fat.	Carbohydrates or Nitrog. Free Extract.	Crude Fibre.		0·45 lb. of Protein.	3·2 lb. of Starch equivalent.
Various—								
Cabbage	15	1·2	0·4	6·5	1·7	9·4	37	34
Mustard	15	1·3	0·2	4·9	1·5	7·2	35	43
Rape	14	1·3	0·5	3·9	1·9	7·0	35	46
*Sweet potato vines	14	1·3	0·5	4·3	1·7	7·0	35	46
Roots, Tubers, &c.—								
Artichokes, Jerusalem	20	0·4	..	15·8	0·2	16·4	112	20
Beets (sugar)	25	0·3	..	20·3	0·5	15·8	150	20
Carrots	13	0·4	0·1	8·9	0·7	8·7	112	37
*Cassava	32	0·3	..	26·4	0·6	26·3	150	12
Mangels	12	0·1	..	8·3	0·3	6·3	450	51
Melon (pie)	6	0·1	..	3·9	0·1	4·0	450	80
Potatoes	25	0·1	..	18·9	..	19·0	450	17
Potatoes (sweet)	31	0·1	..	24·0	..	24·0	450	13
Swedes	12	0·3	..	7·6	0·9	7·5	150	43
Turnips	8	0·2	..	5·5	0·3	4·6	225	70
Pumpkin	8	0·3	0·2	4·5	0·2	4·0	150	80
†*Grains, Seeds, &c.*—								
Barley	86	6·1	1·9	62·4	1·3	72·0	7·4	4·4
Beans	86	19·3	1·2	44·1	4·1	66·6	2·3	4·8
Buckwheat	86	7·5	1·9	42·3	3·5	52·7	6·0	6·1
Corn (maize)	87	6·8	4·3	65·5	0·8	81·8	6·6	3·9
Millet	88	7·4	3·1	45·8	2·7	59·7	6·1	5·4
*Linseed	93	18·1	34·7	18·3	1·8	119·2	2·5	2·7
Oats	87	7·2	4·0	44·8	2·6	59·7	6·2	5·4
Peanut	93	24·6	46·7	10·2	2·4	146·5	1·8	2·2
Rice	87	5·5	0·2	75·8	0·7	82·0	8·2	3·9
Rye	87	8·7	1·1	63·9	1·0	71·3	5·2	4·5
Soja beans	90	26·2	15·8	20·8	1·7	83·9	1·7	3·8
Sorghum	85	4·1	2·5	57·8	1·7	67·9	11·0	4·7
Sunflower	93	11·1	30·7	10·3	9·4	96·0	4·0	3·3
Wheat	87	9·0	1·2	63·5	0·9	71·3	5·0	4·5
Various—								
Bran	89	10·0	2·7	44·3	3·6	48·5	4·5	6·6
Blood meal	91	68·0	2·0	..	..	67·7	0·7	4·7
Butter milk	10	3·8	1·1	4·0	..	9·2	11·8	35·0
Fish meal	90	40·1	11·0	..	..	64·2	1·1	5·0
Meat meal	90	63·6	12·5	..	..	89·9	0·7	3·6
Milk (whole)	12	3·3	3·4	4·6	..	14·7	13·6	21·8
Milk (separated)	10	3·8	0·2	4·7	..	7·6	11·8	42·0
Molasses	76	..	..	54·9	..	48·0	..	6·7
Pollard	89	10·0	3·2	49·8	2·2	68·2	4·5	4·7
Whey	7	0·9	0·8	4·9	..	6·4	50·0	50·0

* Contains hydrocyanic acid and prussic acid yielding glucosides, and must therefore be used with caution.

† Hard grains and seeds need soaking in water, until soft, before feeding to pigs.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, SEPTEMBER, 1921.

The seasonal increase in egg production for the month resulted in nearly every pen adding considerably to its tally. A noticeable feature for the month, and, in fact, during the whole of the test, is the freedom from broodiness. Several very good scores can be reported, viz., H. C. Towers's "F" bird produced the possible, 30 eggs; the following laid 29 eggs each:—W. Becker's "A," H. Fraser's "A," T. Fanning's "C", and E. Morris's "A." R. Burns had four of his six hens producing 28 eggs each, and T. Hindley two with the same number to their credit. The following deaths are reported:—T. Eyre's "C" hen and two birds in T. Hart's group pen of Black Orpingtons. J. W. Newton's "A" hen and Haden Poultry Farm's "A" are at present isolated. The following are the individual records and weights of eggs:—

Competitors.	Breed.	Sept.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns	137	765
*J. M. Manson	Do.	149	750
*W. and G. W. Hindes	Do.	146	748
H. C. Thomas	Do.	120	716
F. Birchall	Do.	127	715
*Geo. Trapp	Do.	142	714
Oakleigh Poultry Farm	Do.	133	707
*Mrs. R. Hodge	Do.	139	701
*H. C. Towers	Do.	143	685
*H. Fraser	Do.	140	682
*C. M. Pickering	Do.	127	674
R. C. Cole	Do.	130	671
W. A. Wilson	Do.	132	654
*J. W. Newton	Do.	123	647
*W. Becker	Do.	137	645
*T. Fanning	Do.	143	641
*C. Goos	Do.	128	621
Mrs. E. White	Do.	128	618
H. Stacey	Do.	131	618
Bathurst Poultry Farm	Do.	124	611
*E. Chester	Do.	124	609
M. F. Newberry	Do.	128	603
*R. C. J. Turner	Do.	121	601
W. Barron	Do.	129	598
*Thos. Taylor	Do.	126	593

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Sept.	Total.
LIGHT BREEDS—*continued.*			
*Thos. Eyre	White Leghorns... ...	132	587
J. W. Short	Do.	130	586
*S. L. Grenier	Do.	132	585
Mrs. E. Z. Cutcliffe	Do.	118	582
*B. Chester	Do.	134	581
*G. Williams	Do.	131	580
O. C. Goos	Do.	110	580
E. Stephenson	Do.	113	574
*Mrs. L. Anderson	Do.	127	570
*E. A. Smith	Do.	135	565
Linquenda Poultry Farm	Do.	128	555
*Haden Poultry Farm	Do.	118	552
*W. and G. W. Hindes	Brown Leghorns... ...	118	550
*H. P. Clarke	White Leghorns ...	129	516
W. M. Glover	Do.	112	508
Crampton Poultry Farm	Do.	116	474
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	145	812
*J. Ferguson	Chinese Langshans ...	132	744
Rev. A. McAllister	Black Orpingtons ...	141	740
Jas. Potter	Do.	104	738
*T. Hindley	Do.	148	736
*R. Burns	Do.	161	729
*A. E. Walters	Do.	140	715
W. Becker	Langshans	139	708
*Parisian Poultry Farm...	Black Orpingtons ...	149	702
Jas. Every	Langshans	124	699
G. Muir	Black Orpingtons ...	134	697
Jas. Ryan	Rhode Island Reds ...	117	689
*C. C. Dennis	Black Orpingtons ...	134	684
*E. F. Dennis	Do.	129	653
*J. Cornwell	Do.	134	644
*E. Morris	Do.	133	638
*E. Stephenson	Do.	125	622
*R. Holmes	Do.	131	614
G. Cumming	Do.	112	579
*N. A. Singer	Do.	141	572
*H. C. Chaille	Do.	125	569
J. W. Newton	Do.	117	552
*A. Shanks	Do.	137	550
*J. E. Smith	Do.	118	549
*Mrs. G. Kettle	Do.	108	544
*E. Oakes	Do. ...	130	497
F. Harrington	Rhode Island Reds ...	129	475
T. C. Hart	Do.	110	395
Total	...	8,940	43,378

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	115	130	135	117	139	114	750
W. and G. W. Hindes (W.L.) ..	135	114	124	138	135	102	748
Geo. Trapp	120	111	119	117	129	118	714
Mrs. R. Hodge	113	127	129	120	126	86	701
H. C. Towers	119	101	117	95	113	140	685
H. Fraser	130	98	119	108	118	109	682
C. M. Pickering	123	117	108	97	130	99	674
J. W. Newton	113	127	126	104	85	92	647
W. Becker	127	123	95	98	135	67	645
T. Fanning	121	101	112	99	99	109	641
C. Goos	107	125	76	77	90	146	621
E. Chester	108	111	101	97	95	97	609
R. C. J. Turner	104	95	95	87	108	112	601
Thos. Taylor	96	112	97	76	86	126	593
Thos. Eyre	98	101	62	109	113	104	587
S. L. Grenier	102	122	72	101	97	91	585
B. Chester	93	93	116	88	111	80	581
G. Williams	138	106	73	83	89	91	580
Mrs. L. Anderson	94	109	97	86	105	79	570
E. A. Smith	126	96	97	92	88	66	565
Haden Poultry Farm	70	82	98	99	95	108	552
W. and G. W. Hindes (B.L.) ..	77	83	77	104	89	120	550
H. P. Clarke	124	75	87	60	87	83	516
HEAVY BREEDS.							
J. Ferguson	121	118	111	138	127	129	744
T. Hindley	133	123	127	99	133	121	736
R. Burns	70	112	153	103	143	148	729
A. E. Walters	130	125	111	114	113	122	715
Parisian Poultry Farm	110	118	118	150	83	123	702
C. C. Dennis	121	107	96	125	116	119	684
E. F. Dennis	90	117	107	107	107	125	653
J. Cornwell	105	87	113	126	104	109	644
E. Morris	115	114	69	125	105	110	638
E. Stephenson	116	101	103	100	87	115	622
R. Holmes	86	98	102	115	132	81	614
N. A. Singer	95	82	93	96	87	119	572
H. C. Chaille	67	106	97	124	106	69	569
A. Shanks	64	94	85	100	101	106	550
J. E. Smith	122	127	97	76	66	61	549
Mrs. G. Kettle	93	106	118	53	77	98	544
E. Oakes	54	104	85	111	77	66	497

WEIGHT OF EGGS, SINGLE HEN PENS.

—	A.	B.	C.	D.	E.	F.	Average
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS.							
S. L. Grenier	2	2	2⅛	2	1⅞	2	2
W. and G. W. Hindes (W. L.) ..	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞
Mrs. L. Anderson	2⅛	2⅛	2¼	2⅛	2⅛	2⅛	2⅛
G. Williams	2¼	2	2⅛	2	1¼	2	2⅛
Mrs. R. Hodge	2	2⅛	2	2	2	2	2
J. M. Manson	2⅛	1¾	1⅝	1⅞	1⅞	1⅞	1⅞
W. Becker	1⅞	2⅛	2	2⅛	2	2	2
C. Goos	2	2	1¾	2¼	2	2	2
J. D. Newton	2	2⅛	1⅞	1⅞	2	2⅛	2

WEIGHT OF EGGS, SINGLE HEN PENS—*continued.*

——	A.	B.	C.	D.	E.	F.	Average.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS—*continued*							
T. Taylor	2 1/8	2	2 1/8	2 3/8	2	1 3/4	2 1/8
Haden Poultry Farm	2	2	2	2	2 1/8	2	2
H. P. Clarke	2	2 1/8	2	2 1/8	2	2	2
T. Eyre	2	1 7/8	1 7/8	1 7/8	1 7/8	1 3/4	1 7/8
H. Fraser	1 7/8	2	1 7/8	2	1 7/8	2	1 7/8
Geo. Trapp	2	2	2	2	2	2	2
T. Fanning	2	2	2 1/8	2 1/8	2 1/8	2	2 1/8
R. C. J. Turner	2 1/4	2 1/8	2 1/8	2 1/8	2	2	2 1/8
W. and G. W. Hindes (B. L.)	2	1 7/8	1 7/8	2	1 7/8	1 7/8	1 7/8
E. Chester	2	2	1 7/8	1 7/8	2 1/8	2	2
H. C. Towers	1 7/8	2	1 7/8	2	2	2	2
B. Chester	1 7/8	1 7/8	2	2	2 1/8	2 1/8	2
E. A. Smith	2 1/8	2 1/8	2 1/8	2 1/8	2 1/4	2 1/4	2 1/8
C. M. Pickering	2 1/4	2	1 7/8	2 1/4	2	2 1/4	2 1/8
HEAVY BREEDS.							
T. Hindley	1 5/8	1 7/8	2	1 7/8	1 7/8	2	1 7/8
R. Burns	2 3/8	1 7/8	2 3/8	2 1/4	2 1/8	1 7/8	2 1/8
E. F. Dennis	1 5/8	2	2 1/8	2 1/8	2 1/8	2	2
A. E. Walters	1 7/8	2 1/8	2	2 1/8	1 7/8	2	2
Mrs. H. H. Kettle	2 1/8	2 1/8	1 7/8	2	2 1/8	2	2
Parisian P. Farm	2	2	1 7/8	1 3/4	2	2	1 7/8
J. E. Ferguson	1 7/8	2 1/8	2 1/8	1 7/8	2	2	2
R. Holmes	1 3/4	2 1/4	2	1 3/4	1 7/8	2	1 7/8
A. Shanks	2 1/4	2 1/8	2 1/8	2 1/8	2	2 1/8	2 1/8
J. E. Smith	1 3/4	1 5/8	1 7/8	2	2 1/8	2 1/4	1 7/8
E. Stephenson	2	2 1/8	1 7/8	2 1/8	1 7/8	2	2
N. A. Singer	2 1/8	2 1/8	2 1/8	2	2	2 1/8	2 1/8
E. Morris	1 7/8	2 1/8	2 1/8	1 7/8	2	1 7/8	2
H. Chaille	2	2	2	2 1/8	1 3/4	2 1/2	2 1/8
E. Oakes	2	1 7/8	2	1 7/8	2 1/4	2 1/8	2
C. C. Dennis	2	1 7/8	1 3/4	1 7/8	1 7/8	1 7/8	1 7/8
J. A. Cornwell	2 1/8	2	2	1 7/8	2	1 7/8	2

GROUP PENS.

——	Average.	——	Average.
LIGHT BREEDS.			
	Oz.		Oz.
W. M. Glover	2 1/4	H. C. Thomas	1 7/8
H. Stacey	1 7/8	Mrs. E. Cuteliffe	2
O. Goos	2 1/8	J. Short	2 1/8
R. Gill	1 7/8	Linquenda P. Farm	1 7/8
Oakleigh P. Farm	1 7/8	F. Burchall	2
E. Stephenson	2	Brampton P. Farm	2 1/8
R. Cole	2	Bathurst P. Farm	1 7/8
Mrs. E. White	2	M. F. Newberry	2
W. A. Wilson	2	W. Barron	1 7/8
HEAVY BREEDS.			
W. Becker	1 7/8	G. Cummings	2
J. Ryan	1 7/8	G. Muir	1 7/8
T. Hart	2	T. Fanning	2 1/8
Rev. A. McAllister	2	J. Newton	2
F. Harrington	2	J. Every	1 7/8
J. Potter	1 3/4		

CUTHBERT POTTS,
Principal.

The Orchard.

THE FRUITGROWING INDUSTRY.

By ALBERT H. BENSON, M.R.A.C.

I.

(The first of a series of articles relating to marketing methods and problems, containing suggestions for the consideration of all engaged in fruit production.)

Fruitgrowers, not only in Queensland, but in the whole of the Commonwealth, are beginning to realise the unsatisfactory condition into which the selling end of their industry has been allowed to drift, and to recognise that the only way to place it upon an improved basis is to radically and drastically alter the methods employed for the disposal, distribution, and utilisation of their products.

The difficulty confronting growers to-day is not how to grow fruit, but how and where to sell it. This difficulty is not a new one. It is one that has, year after year, been discussed at local, interstate, and Australian fruit conferences since the first interstate assembly at Mildura in May, 1894. At the Australian conference at Sydney in August last a discussion on marketing problems was a leading item on the business-sheet. Many suggested solutions have been brought forward for discussion from time to time, and these have been wide enough to cover—

(1.) Co-operation among growers to open up oversea markets;

(2.) Obtaining facilities for transport thereto;

(3.) Improved means of interstate transport;

(4.) Institution of more efficient marketing organisation;

(5.) Popularising the use of fruit; and

(6) The employment of every other means of creating a stronger demand within the Commonwealth.

These ideas are all sound and practical, as are also other proposals in respect to the conservation and utilisation of surplus supplies.

Unfortunately, however, although growers have repeatedly affirmed the desirability of initiating reforms whenever they met to discuss the position and condition of their industry, they have, apparently, remained content with merely carrying resolutions, instead of translating good will to strong action. The matters involved have thus been carried forward from conference to conference, and so repeated decisions have, consequently, through failure to sustain the energy of the initial effort, remained inoperative or ineffective. In this way conferences fail to accomplish much of their real purpose. Unless resolutions are made effective and co-operative effort becomes more than merely a platitudinous term and more of an actual fact, the industry cannot attain the degree of importance in the commercial world that it obviously merits. It is difficult to account for this inertia, but it is probably due to the fact that so very little real co-operation exists among fruitgrowers, who, like their confréres in other branches of agriculture, are often very conservative and suspicious of any innovation. This spirit seems to continue to exist in spite of the knowledge that the value of co-ordinated and co-operative effort has been incontestably proved as really the only means by which primary producers can place their industry on a sound business basis.

At the present time the most serious difficulty facing fruit producers is their inability to place their products, in one form or another, at a price that will provide a fair thing for both producer and consumer. This failure in properly organised distribution is a very serious bar to the extension of the industry. It also affects the general health of the community, for fruit is held to be a dietary essential. This, in a country like Australia, which is capable of producing practically every variety of cultivated fruit, should not be. Even in our furthest back country, fruit should, under a proper system of distribution, be readily obtainable at reasonable rates.

The question of distribution is, therefore, of vital importance to every grower and consumer, and the time for altering and improving present marketing methods is *now*. Unless obvious business difficulties can be quickly overcome, I feel certain that the fruit industry will meet with a serious check, and many growers will be hard hit. I have no wish to be pessimistic, nor do I think there is any immediate

necessity to be so, for on every side are signs of a general awakening. Still, I think it right to sound a timely note of warning, as, in my opinion, we cannot afford to waste any more time, but must make a determined effort immediately to grapple with the problems awaiting solution. Under existing conditions we are quite unable to cope with fruit-marketing difficulties at certain periods. We have had gluts, and we shall have them again, and the lessons they teach are obvious. At the time of writing, strawberries and bananas are returning little, if any, profit to the grower, and locally-grown lemons and Seville oranges are practically unsaleable. Over-supply of limited markets is plainly disastrous. These facts are known to all who take an intelligent interest in affairs, and they are enough to show the immediate necessity of vigorous business action.

The increased orchard acreage in all States adds to our difficulties and increases the urgency of organisation to meet them. Increased production will, naturally, intensify the market congestion that occurs at periods corresponding with the ripening of certain fruits, the nature of which compels their immediate disposal. This big increase in the area under fruit in all the States is mainly due to two factors—the policy of water conservation and the consequent utilisation of irrigable areas, and to the settlement of large numbers of returned soldiers. No provision has yet been made for the increased production that naturally follows extended settlement. Hence the necessity for market organisation and the improvement of every facility for satisfactory selling becomes every day more urgent. The question, therefore, naturally arises—what can be done to save the situation?

Before this question can be answered, it is necessary to determine what markets are accessible for both fresh and preserved products. In Queensland we want outlets for bananas, pineapples, papaws, mangoes, custard apples, strawberries, citrus fruits, and other products of the coastal districts, and also for the deciduous fruits of the granite belt.

In tropical products we have an advantage over the other States excepting a small region on the north-east coast of New South Wales. Consequently, there is practically no opposition, and that competition is confined almost entirely to bananas. Citrus fruits are, however, grown in all the other States, Tasmania excepted, and our only advantage rests in the fact that our citrus products ripen earlier; further, our mandarins are so superior in quality to the southern-grown that we can well hold our own on southern markets.

Though we have virtually a monopoly in the supply of tropical fruits, our system of advertisement and methods of distribution are so faulty that many Queensland fruits are quite unknown in other States. Lack of organisation, and, therefore, publicity on the part of our growers, is largely responsible for this state of affairs. Until recently no attempt had been made to reach markets other than those of the State capitals, and so familiarise southern consumers outside the main centres with Queensland fruits. Organisation, stabilisation, and judicious advertisement are essentials of successful marketing, and each can be covered by sound co-operative effort. Bananas, pines, and citrus fruits can be supplied to every railway station in the Commonwealth, provided packing, transport, and distribution are properly arranged. The more perishable products can be sent to many markets where they are at present unknown, under the same conditions.

These ideas are not theoretical, and all, judging by the great success of co-operative marketing systems operating in other countries, are well within practical range. Producers' organisations in the United States are at present distributing tropical as well as temperate fruits all over the Union. Incidentally, the results of forty years of American enterprise and experience are at our disposal when seeking a satisfactory solution of our own problems. What can be done there can be done here. The inauguration of the southern fruit trains by the Southern Queensland Fruitgrowers' Association is only a beginning of what may be accomplished, and is in itself evidence of the value of united and well-organised effort. When this trade is extended and distribution widened beyond the capital cities, its present limit, I feel certain that, in respect to our tropical and sub-tropical fruits, we shall have a market within the Commonwealth for the whole of our production.

For example, take bananas. At present the bulk of our exports are being railed to only the capital cities, where they are handled by wholesale distributors, who have, so far, made little, if any, attempt to supply many smaller markets, with the result that there are many centres all over Australia in which Queensland fruits are unknown, or unobtainable. If a demand is created, it is only supplied at exorbitant prices that make fruit, that should be looked upon as a necessity, a luxury for which the market is extremely restricted. It is not necessary even to go outside our own State to observe accessible yet unexploited markets. Go into the western country and note the price at which bananas are retailed—there is no need to leave the railway—and then say we have an unplaceable surplus! Get the fruit on to the

consumer's table at a reasonable price and increased consumption will surely follow. As an article of diet, fruit is a healthy essential, more particularly to inland dwellers.

The first, though somewhat halting, step has been taken to develop our southern fruit trade; the next step is to make the most of our home opportunities. Further development will inevitably follow. What is being advocated is no new thing. The building-up of the banana trade between the West Indies and the United Kingdom is an object lesson in scientific distribution, and the history of the business firm that inaugurated that enterprise reads like a romance. Our present haphazard methods of distribution are against increased local consumption, and they call for a careful study of solutions applied to similar problems in other fruit-producing countries.

At present we have only two available means of transport—sea and rail. The former necessitates shipment and transhipment, without proper facilities and suitable provision for the conveyance of perishable produce. This leaves our railways as the better means of transport, and they should, in my opinion, be used as a distributing agency to a far greater extent than at present. All the populous centres in the Commonwealth are served by rail, and are, therefore, open to ready exploitation. Our railways are already used as a distributing medium of goods by parcel post, and bulky packages are sent by city firms on the cash-on-delivery system. There seems no apparent reason, then, why the same facilities should not be extended to producers of fruit. A system of distribution could thus be organised in connection with existing agencies, and duplication avoided. The details of such a scheme would require much thought, and no doubt a practical arrangement with the railway authorities could be evolved.

I give the following suggestions for what they are worth and as possible material for a sketch of a scheme for connecting the interests of the producer and the consumer in present undeveloped markets:—

Every railway station to be made a distributing centre;

Where the trade warrants it, a receiver or distributor to be appointed on a commission basis, preferably a returned soldier incapacitated for heavy work;

The duties to include canvassing for orders, from retailers as well as the general public, in case lots of one or more. Prompt despatch of orders to the secretary of the Fruitgrowers' Association in the district of supply.

Goods to reach local distributor on a fixed date for immediate distribution.

The local distributor to remit, by draft, proceeds of sales. Growers to be protected by a fidelity guarantee bond.

In centres where the trade does not warrant the appointment of a local distributor, arrangements to be entered into with the Railway Department for the distribution of case lots on the cash-on-delivery system at present in vogue in connection with the country parcel trade of city firms.

THE EFFECT OF MANURING ON THE CARRYING AND KEEPING QUALITIES OF BANANAS.

By ALBERT H. BENSON, M.R.A.C.

This is a question that crops up periodically, and regarding which there is a very great difference of opinion. Some banana-growers claim that the application of artificial fertilisers has a decidedly deleterious effect, and state that the fruit that is produced on the plants to which such fertilisers have been applied keeps and carries badly. On the other hand, other growers state that their experience has been just the reverse, and that the fruit produced by the plants that have been most heavily manured has been forwarded by them successfully to the most distant markets. As this matter has recently been again brought under the notice of the Department of Agriculture, inquiries have been made of growers who have for years been manuring their plantations heavily with complete artificial fertilisers, and the information supplied shows that they have never had any complaints regarding the keeping or carrying qualities of their fruit; further, that they have received top prices for their produce, for which there is a regular demand from buyers for distant markets. This is the experience of growers who have been using complete fertilisers in accordance with the advice given by this Department, and if other growers who claim that fertilisers injure their fruit will follow the same advice, it is probable that they will change their opinion.

The use of a badly balanced artificial fertiliser containing a great excess of either acid phosphates or readily available nitrogen, in large quantities on land that is deficient in organic matter or humus, might produce the adverse effect claimed, but a well-balanced fertiliser, even though applied in much larger quantities, will have no injurious effect whatever, but, on the contrary, prove a very profitable investment. Good bananas cannot be grown unless the soil possesses a good supply of humus as well as of all essential plant-food in an available form.

A FINE NAVEL ORANGE.

A representative sample of a small crop of fine navel oranges from a tree nine years old grown by Mr. F. A. Allen, at Nalembah, near Aramac, in the Central West, in open downs country, well cultivated without manure, and supplied with artesian water. Fruit perfect, with skin clean and well coloured. Weight, 2 lb. 2 oz.

PLATE 68.—A FINE NAVEL ORANGE.

Horticulture.

FLOWERING TREES OF THE BRISBANE BOTANIC GARDENS.

BUTEA FRONDOSA.

Natural Order Leguminosæ.

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—*Butea,* named in honour of the Earl of Bute; *frondosa,* from leafy, umbrageous.

Description (from Roxburgh's "Plants of Coromandel," 1795).—An erect tree reaching a height of from 40 to 50 ft. Trunk irregular, generally a little crooked, covered with ash-coloured, spongy, thick, slightly scabrous bark, the middle layer of which contains a red juice. From natural fissures and wounds made in the bark during the hot weather there exudes a beautiful juice that soon hardens into a ruby-coloured, brittle, astringent gum; but it soon loses its beautiful colour if exposed to the air. To preserve the colour the gum must be gathered as soon as it becomes hard, and kept closely corked in a bottle; pure water dissolves it, and the solution is of a deep red colour, used in dyeing.

Branches very irregular, bent in various directions, young shoots downy, leaves alternate, in threes, from 8 to 16 in. long, leaflets emarginated, or rounded at the apex, leathery; above shining and fairly smooth, below slightly hoary; entire, from 5 to 7 in. long, and from 3 to 4½ in. broad. Common petiole round, swollen at base, when young downy, racemes terminal, axillary, and from tuberosities over the naked wooded branches, rigid, and covered with a soft dark-greenish purple-coloured down.

Flowers.—Papilionaceous, pendulous, numerous, pedicelled, large, their ground colour a beautiful deep red shaded with orange and silver-coloured down that gives them a most beautiful "Indian red" appearance. Calyx campanulate, leathery, two-lipped, upper lip large, under lip three-toothed, covered with the same dark greenish-purple down as racemes. Petals bright orange red, thickly clothed on outside with silvery tomentum, reflected, pointed, upper one slightly over 1 in. in width, keel semi-circular, beaked, filaments one and nine in a regular semicircle, anthers equal, linear, erect, style ascending, a little longer than filaments, stigma small; individual flowers are about 2½ in. in length.

In addition to the gum already mentioned, the flowers, either fresh or dry, are used in India for dyeing purposes; they are prepared by infusion, and dye cotton cloth a most beautiful bright yellow, more or less deep according to strength of infusion. A little alkali added changes the colour to a deep reddish orange, but the least acid changes it to a yellow or lemon.

Pod.—Large, pendulous, all but the apex where the seed is lodged, downy, about 6 in. long by 2 in. broad, never opens by itself; seed one, lodged at point of pod, oval, much compressed, smooth brown, about 1 to 1½ in. long and 1 broad.

Habitat.—Plains from the Himalayas to Ceylon and Burmah, ascending to 4,000 ft. in the north-west.

This beautiful flowering tree that forms such a bright-coloured feature of the Indian landscape during March and April flowers in Brisbane in November, and the fine specimen on corner of lawn below the bandstand in the Botanic Gardens attracts the attention of visitors by its vivid mass of colour when in flower, it being very conspicuous owing to the fact that the foliage falls off just previous to flowering.

Propagation.—Unfortunately, owing probably to being rather far south for this magnificent tree to be properly at home, although it flowers well each season, very few pods are produced, and only occasionally are seeds obtained.

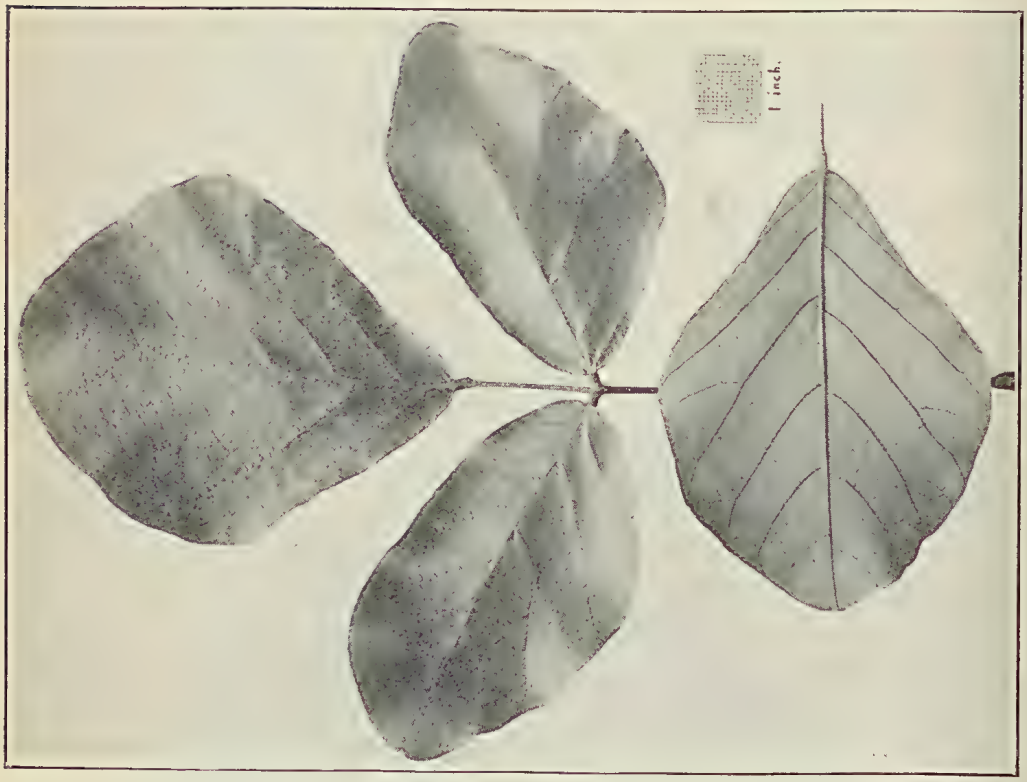

PLATE 70.—*Butea frondosa*: LEAVES.

PLATE 69.—*Butea frondosa*: FLOWER STEM.

Viticulture.

DOWNY MILDEW.

In accordance with a request made by vignerons of districts that suffered by the incursion of downy mildew last year, a Regulation under "*The Diseases in Plants Act of* 1916" has been issued by His Excellency the Governor in Council providing for the treatment of all grape vines affected with this disease. The prescribed treatment provides for at least three sprayings and such further sprayings as may be deemed necessary by a fruit inspector. It is only compulsorily applied when the disease has made its appearance in a vineyard.

Downy mildew can be prevented by systematically spraying the vines before it appears. Growers are urged to spray for their own protection. In respect to sprayings definitely provided for by the Regulation, it is questionable whether the first spraying, which is given just before the buds burst, is actually needed, but it is certainly of great value in the case of anthracnose or "black spot," which is a very serious and common fungoid disease of the vine. It is often found attacking the same plant as downy mildew, and should not be neglected. The second spraying before the vines blossom, that is, when they have grown from 10 to 18 in., protects the new growth from infestation; and the third spraying, given when the blossom has set, protects the foliage produced after the second application.

If the weather conditions are very favourable for the development of the fungus causing downy mildew, viz., warm, moist, or foggy, it may be necessary to give an extra spraying, or even two, between the second and third sprayings, for which the Regulation referred to makes provision. These extra applications may be made even during the blossoming period as it is better to run the risk of losing a few berries than the loss of the whole crop. The number of sprayings necessary after the fruit has set will depend entirely on the weather. If it is warm and dry further applications may not be necessary, but if moist and muggy, spraying must be continued, otherwise the new growth will suffer and the bunches will become affected.

The fungus that causes downy mildew is not merely a surface growth, but it extends right through the vine and is carried over from season to season by the spores that remain dormant in the old leaves during the winter and become active in the spring—probably about the end of September or early in October in the coastal districts, and a little later in inland regions. These spores are carried by the wind, and, if they lodge on the upper side of a moist vine leaf, they begin growth at once, provided the atmospheric conditions are favourable and the leaf has not been protected by spraying with a germ-destroying specific.

The first sign of a disease is a brownish spot on the upper surface of the leaf that looks as though a drop of oil had been deposited upon it. This is known as the "oil-spot" stage. In the course of a day or so a white downy growth appears on the under side of the leaf exactly opposite the "oil spot," and it is from this development that the disease takes its name. This downy growth produces countless spores, which are distributed broadcast by the wind. Each of these spores is capable of reproducing the disease if it comes in contact with a vine leaf under conditions favourable to its development.

When neglected, downy mildew spreads with alarming rapidity when the weather is favourable, and the entire crop of a district may be destroyed in a very short time; hence the great importance of taking precautionary measures.

The plate illustrating these notes gives a good idea of the disease in the "downy" stage, and should enable anyone to recognise it at once. In the later stage of the disease the leaves turn brown, dry up, and fall off, the fruit is destroyed, and, in severe cases all new wood growth is killed, so that not only is there no crop for that season but none also for the following year.

REMEDY.

The remedy for this disease is to give the leaves of the vine a protective covering before the resting spores become active in spring, and to keep them protected as long as risk to the crop exists. The best spray is Bordeaux mixture, 4-4-40; 4 lb. bluestone, 4 lb. quicklime, and 40 gals. water, made according to the directions given in departmental publications dealing with the destruction of fruit and vegetable pests. The spraying material must be neutral; that is to say, it must not contain any free sulphate of copper (bluestone), and this is determined by adding a drop of a solution of fero-cyanide of potassium to a small quantity of the mixture. If there is no

discolouration, the mixture is neutral, but if there is a brown ring round the drop of fero-cyanide, free bluestone is present and more lime must be added. If vignerons have any difficulty of obtaining fero-cyanide of potassium, a small quantity of the solution for testing purposes can be obtained from the Agricultural Chemist.

PLATE 71.—DOWNY MILDEW ON VINE LEAF.

The Regulation referred to is as follows, and must be complied with by every person whose vines are affected by downy mildew:—

"Every occupier, or if there is no occupier the owner, of any land whereon plants of the genus Vitis (grape vine) are grown shall cause all such plants as may be affected with the disease of downy mildew (Peronosporeæ) to be sprayed with Bordeaux or Burgundy mixture to the satisfaction of an inspector, first when the buds are swelling and prior to their opening, and subsequently once before the vines come into flower, and again immediately the fruit has set. Should downy mildew make its appearance subsequently, further sprayings shall be given as and when an inspector shall direct."

Tropical Industries.

SUGAR FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 21st October, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

"Early in September the Innisfail district, comprising Goondi, Mourilyan, and South Johnstone mills, were visited.

"The town of Innisfail itself was, as usual, very busy, and accommodation very hard to obtain.

"*Goondi.*—A great deal of rain has fallen on this area, delaying planting operations considerably, and also preventing the recently cut ratoons from getting away as they should. Under these conditions, prevailing up to the middle of the month, the task of keeping the mill supplied with sufficient cane was anything but an easy one. About that time, however, a fine spell had set in, and all over the district the farmers were busy. As far as could be ascertained, the several mills in the district will all probably cut short of their earlier estimates, the wet weather being the principal cause, although rats, borers, and, in places, a few grubby patches help to account for the shortage. The borers are very bad this year throughout the district, both plant cane and ratoons suffering. The rat pest is, of course, more apparent on low-lying river and creek banks.

"The principal cane grown is Badila, with some small quantities of H.Q.426, and 7R.428. The demand for new varieties from the South Johnstone Experiment Station has been very keen, and a good deal of E.K.1, E.K.28, H.109, Tableland Badila, Hybrid No. 1, Q.903, Q.813, Q.855, and various other new canes have been supplied. At the Experiment Station the chemist in charge has been kept very busy supplying plants to local centres, and also to the Herbert River, Babinda, and Cairns. Adjoining the Goondi area a good deal of liming has been carried out. I am told that good-quality coral sand is being sold at £3 per ton locally, whilst burnt coral lime is worth £4 per ton. Some farmers are manuring heavily, and quite a number of tractors are in use in this prosperous centre.

"*Mourilyan Mill.*—In this area conditions are practically similar to Goondi. As regards lime, however, they are not so well situated as the Goondi growers, as the extra cost on the Mourilyan side of the river makes it very expensive to handle. I am informed that some 500 tons of manure, consisting principally of basic super, Shirley's Three Sevens, meatworks, dried blood, and sulphate of ammonia, have been already ordered on account of next season's crops.

"*Maria Creek Soldiers' Settlement.*—This area will send its cane in to the South Johnstone Central Mill. A considerable improvement was noted since my previous visit, and evidently a vigorous development policy has been carried out by the Supervisor (Mr. Martin).

"The ex-soldiers are now very busy clearing and burning off new blocks, taking advantage of some fine weather to get through as much work as possible. There are at present about fifty settlers in residence, some fifteen of them having their wives with them. New men are continually arriving, and the place promises to be a very busy one in the near future. The cane seen is backward, but looks fairly healthy and very green.

"The cane area is now as follows:—

Planted 1920	187 acres
Planted 1921	100 acres
To plant 1921	370 acres
To plant 1922	120 acres
	777 acres

giving a total of nearly 800 acres for 1923.

"The Railway Department is pushing the line connection ahead as rapidly as possible, and about the end of November should see the settlement linked up with the South Johnstone Central Mill and Innisfail. The cane now being grown is Badila, but Mr. Martin has also planted out a small plot of new canes from the experiment station.

"*South Johnstone Central Mill.*—This area also comprises Japoon and Liverpool Creek lands. The mill was very busy trying to make up the leeway caused by the late strike, and was getting away with a full supply of cane in good style. Although much valuable time was lost through the strike, both growers and men seem to think that, individually, it has done a certain amount of good, as the present relations are much more satisfactory. As mentioned earlier in these notes, the expected tonnage to be harvested will probably fall below the earlier estimates. Rats and borers have caused considerable damage in the district, but, luckily, the damage from grubs is mainly confined to the 17-mile. Badila represents nearly 95 per cent. of the cane now growing here, but full advantage is being taken of the proximity of the experiment station to obtain plants from there. Not many tractors are in use in the area. Mr. Sugden is now trying the effects of a dressing of lime earth upon one of his cane paddocks.

"*Japoon and Liverpool Creek.*—These areas have also suffered from wet weather, the cane not throwing the growth that it should. In places the trash clings very tightly to the cane, and top shoots are very noticeable. Arrowing here is also as prevalent as in the surrounding areas.

"Considering the weather, it is pleasing to know that the c.c.s. of the cane is very steadily improving. A lot of ploughing and planting is in progress.

"Taking the Innisfail district throughout, it is a very busy one. At South Johnstone, especially, everything is very active, and all hands are doing their best to make up for the enforced idleness of the late strike.

"*Babinda.*—Continuous rain has hindered planting operations. Cane planted later on was looking very fair, whilst the ratoons, although comparing very favourably with those recently visited in other areas, had not the vigorous growth usually so characteristic of this district. Also, although a good deal of 'arrowing' was present, it was not so noticeable as elsewhere. Caterpillars had also attacked and knocked back a lot of the young cane. Badila is by far the main cane grown here, but several growers are trying out new canes from the South Johnstone station.

"Owing to the wet, harvesting operations are very strenuous, and the supply of cane is light in consequence.

"So far the mill officials hope to finish crushing shortly before Christmas, and all hands are fervently hoping for a spell of really fine weather with this in view. As regards pests, the area seen so far is fairly free.

"Borers are fairly active in several places, but the rat pest is not serious."

The Southern Field Assistant, Mr. J. C. Murray, reports, under date 21st October, 1921, as follows:—

"In the course of September, Childers, Nambour, and Bundaberg were inspected. A visit was also made to Beenleigh in connection with the judging of the cane exhibits at the local show.

"*Childers.*—This district is looking very prosperous at present. The cane is cutting well, and the field workers are giving satisfaction. Density is good, and is gradually improving. The most satisfactory variety in this latter respect is Mauritius 1900 Seedling. Other varieties are doing well, farmers having no complaints to make against the returns of D.1135, Black Innis, Petit Senneville, and Q.813.

"The Mauritius cane, Petit Senneville, is not widely grown, but where it is raised the planters like the cane. It is fairly resistant to disease attack, produces good crops, and strikes usually with a low percentage of misses. A characteristic of this cane is that it occasionally shows more than one eye growing near the node.

"Intensive cultural methods are being employed. Many growers contend, and with a certain degree of accuracy, too, that, owing to the rapidity with which unfertilised volcanic soils responded after the rains in mid-autumn, artificial treatment is, on the whole, unnecessary as yet. The red soils are, however, deficient in humus, and while growers may not get positive results immediately following a vegetable manuring, the results of green cropping will prove satisfactory in the end.

"There are not many complaints of disease. Some canes are showing the effect of 'rust' and 'striped disease,' but the areas affected are limited. 'Gumming,' in isolated patches, is slightly depreciating the value of the cane.

"While visiting the Beenleigh Show I met a considerable number of sugar-growers and farmers who are going in for cane. Arrowroot has practically ceased to be a paying proposition, owing to the slump in the market, and the present stability of the sugar industry is attracting the attention of arrowroot planters.

"Of the canes exhibited at the show, none of the later distributed varieties was noticeable, but the exhibit was very fine on the whole, especially the Demerara 1135. However, the growers are in possession now of several new canes sent out by the Bundaberg Experiment Station, and perhaps next year some of these may be shown.

"While in Beenleigh I was much impressed by the general efficiency of the community, and by the standard of the agricultural exhibits generally.

"At Nambour the cane harvest is proceeding satisfactorily. The cane is cutting with good weight per acre, and the c.c.s. tests are well up to the average. Of the varieties being milled from immediately round Nambour, D.1135, H.Q.285, and M.1900 Seedling are making the best showing. Other varieties grown on a lesser scale are giving satisfaction, as also are Reintroduced D.1135, Q.813, Petit Senneville, N.G.16, and Malabar.

"The Nambour area is at present remarkably free from disease and natural enemies to the cane, with, perhaps, the exception of water-rats. The latter come up from the creek, and loss on a minor scale occurs, although the farmers use every effort to check them.

"Up at Mapleton there is considerable activity. Growers have some good cane land free from frosts, with an abundant rainfall. 1900 Seedling is a variety that should do well on these altitudes. D.1135 is at present the staple variety. The growers are recommended to try Q.813, Reintroduced D.1135, Q.970, Q.1098, E.K.1, and Shahjahanpur No. 10. These varieties should do well on the range.

"Conditions in the Bundaberg district are satisfactory. Very few, if any, industrial disputes have occurred, and the mills are smoothly working. Sugar content of the cane is improving as the season advances; also tonnage per acre. The standard varieties are giving good results this crushing, especially 1900 Seedling.

"One grower on the Woongarra area got from second ratoons of this cane 35 tons per acre, with an average c.c.s. of 14.

"Good strikes of young plant cane are in evidence, and the growers have noxious weeds well under control."

ENTOMOLOGICAL NOTES.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, dated 25th October, 1921, from the Entomologist, Mr. E. Jarvis:—

"The weather conditions during the period 27th August to 23rd September have been favourable to the development of our cane beetle, *Lepidoderma albohirtum*, all of which are at present in the pupal state, awaiting those profound changes which will eventually allow them to wing their way to the forest trees, and incidentally into the canefields.

"At our laboratory, the rainfall for this month has been 1.45 in., and the average temperature in the shade 70.5 deg. F.

"NOTES ON MUSCARDINE FUNGUS.

"Readings of the thermometer between the dates 13th to 31st August were particularly interesting, since they helped to illuminate certain matters relating to spore germination of the parasitic fungus *Metarrhizium anisopliæ*. During this period of nineteen days, while the mean shade temperature was 68.6 deg. F., no less than twenty-two third-stage larvæ of albohirtum were killed by this fungus.

"These grubs, which had been paralysed by scoliid wasps (*Campsomeris tasmaniensis* Sauss.) had lain in shallow earthen cells for about two weeks prior to the first fungus attack, so presumably must have become infected by this vegetable parasite in the field before encountering the digger-wasps. Germination of the spores, however, did not take place until the abovementioned temperature prevailed, although during this fortnight preceding the first outbreak of the fungus fifty or more paralysed grubs had been lying in our breeding-trays under exactly similar conditions of handling. The only apparent difference was that the maximum and minimum shade temperatures during that two weeks were 75.5 deg. and 50.8 deg. F., respectively.

"Thus, it appears likely that this slight variation (an additional 2 deg. in the average maximum, and 8.7 deg. in the minimum temperatures) is sufficient to cause germination of the spores of metarrhizium.

"It may be mentioned here that our highest mortality occurred during a mean shade temperature of 67.8 deg. F.

"The above observations will, it is hoped, prove helpful during future experimentation in connection with control work against our various cane pests.

"BREEDING DIGGER-WASPS.

"Four years ago the writer studied the life-history and habits of two native species of *Scoliidæ* that are parasitic on the grubs of our cane-beetles, and succeeded in breeding from the eggs three successive broods of wasps in the one season. The winter brood, however, was not followed up at the time, so is being investigated now, and some further interesting data has been secured.

"Cool winter conditions, as might have been expected, somewhat retard development of the various stages of these parasites. The eggs, for instance, which during summer weather hatch in three days, took from seven to ten days, or even longer; and the period occupied by the combined egg and maggot stages varied from eighteen to twenty-four days under an average shade temperature of 68 deg. F. These combined stages in the summer brood, however, during January occupy a period of only twelve days, the average temperature at that time being much higher (about 82 deg. F.).

"The method of handling larvæ and pupæ of digger-wasps adopted by the writer in 1918 is illustrated in the accompanying photograph of a portion of a breeding-tray stocked with rows of victimised grubs, together with egg, maggot, and cocoon stages of the parasite.

"Each wasp is confined in a small metal cage enclosing a cane-grub covered by about 14 cub. in. of soil, the helpless grub being removed daily and a healthy one supplied. The paralysed hosts are then transferred at once to a breeding-tray of damp compacted soil, in which numerous shallow concavities have been impressed. The wasps are fed daily with honey and water, and, although subjected to close confinement, live about a couple of months.

"From data just obtained it appears that there are four broods of the digger-wasps *Campsomeris tasmaniensis* and *C. radula* every year. Those giving rise to what we may term the first or spring brood commence to oviposit towards the end of September, the earliest eggs having been obtained on the 22nd and 27th of that month. Egg-laying, however, becomes general towards the end of October, and the wasps finally emerge from this brood about the middle of December.

"The period occupied by the summer brood, or second generation, extends approximately from middle of December to middle of February.

"The autumn, or third generation, originates from wasps emerging throughout March, oviposition occurring from about the end of that month to beginning of May, and flighting of the adult wasps from May to August.

"Eggs producing the winter brood are laid in June and July; and at present we have only cocoons, from which wasps of the fourth generation are expected to emerge in a week or so.

"Further details of technique employed in this connection need not be given here, but it may be of interest to state that in the event of our deciding to introduce wasp parasites from other countries, we shall be in a position to handle them during transit in a manner best calculated to keep them alive and ensure successful introduction.

"THE CANE-BORER AND ITS PARASITE.

"A trip was taken to Babinda on 31st August, and again on 19th September, with the object of securing specimens of Tachinid fly parasites (*Ceromasia sphenophori*). Thanks to the courtesy of Mr. A. McColl, manager of Babinda Central Mill, I was enabled to visit Meriwinni, Mooliba, and other districts, in company with one of the cane inspectors, Mr. G. Robinson.

"As a result of our investigations a number of Tachinid flies were captured, with which to commence breeding experiments at Meringa.

"These were found resting on loaded trucks of cane, some in the mill yard and others at Mooliba. Pupæ of the fly were also located in borer-infested cane from several farms, so that it should not be a difficult matter to breed hundreds of specimens of this parasite for future liberation in districts affected by the beetle-borer around Babinda and Gordonvale. Growers in the former area that may be troubled with the borer are, therefore, asked to forward samples of infested stalks to Meringa railway station for examination. It would not be much trouble to cut a sack-full of badly bored cane; and such consignments would be of considerable value to us, and receive due acknowledgment and report.

"The fact of this parasite being in evidence at present on farms that are suffering greatly from borer attack indicates either that its work is inefficient, or that its increase is being constantly checked in some way. Unfortunately, burning of the trash, although doubtlessly helpful in controlling the borers, destroys also its parasites. Continued indiscriminate burning would, before long, probably result in

Photo. by E. Jarvis.]

3 2 1

PLATE 72.—PORTION OF BREEDING-TRAY HOLDING LIFE-CYCLE STAGES OF THE DIGGER WASP (*Campsomeris tasmaniensis* Sauss.); half natural size.

disappearance of the fly from such localities. A small patch of bored cane should accordingly, when possible, be reserved in some obscure quarter as breeding-ground for the fly, and this should not be burnt.

"Bait collecting has achieved great results in times past; and since this method of control is within reach of every grower, and affords a means of materially checking the ravages of this pest, its merits should not be altogether overlooked. These baits consist, as most growers are aware, merely of pieces of split cane about 18 in. long, which are placed in heaps—of from ten to twenty pieces—near or among the cane plants. As a result of rather extensive experimentation in Fiji, it was seen that molasses smeared on the baits did not make them more attractive, and that baits cut from decomposing canes attracted far more borers than those consisting of fresh cane. It appears, also, that collections made every second day from heaps placed near the border of a plantation gave better results than frequent collections (three times a day) derived from single baits laid throughout the field.

"With regard to the question of collecting the beetle-borer, I may mention that about 3,600 specimens weigh 1 lb., and that this number of weevils is able to destroy at least 5 acres of cane. In cases of severe infestation it would, I think, be well worth our while to collect them. By laying bait-traps immediately after cutting the crop, large numbers can be caught at little expense, as the beetles that have been dislodged from the cane usually concentrate on these baits for many days after the crop has been cut.

"Some plants of the cane H.146, a variety which is said to be resistant to attacks from the beetle-borer, have just been received from the General Superintendent, and a grower at Gordonvale has been kind enough to plant them among a patch of D.1135, on land that is usually favoured by this pest. It will be interesting to note, later on, whether the borer-beetle attacks the surrounding cane in preference to the variety in question."

DESCRIPTION OF PLATE.

Row 1.—Cells Nos. 1 to 10; maggots of wasps feeding on cane-grubs.
Row 2.—Cells Nos. 8, 9; eggs of wasps attached to grubs, near legs.
Row 3.—Cells Nos. 1 to 7; cocoons of wasp.

Photo. Live Stock Bulletin.]

PLATE 73.—LYNDHURST PRINCESS IMPERIAL, THE PROPERTY OF MR. C. E. McDOUGALL.
First Prize Shorthorn Cow, 4 years or over; and First for Cow with Calf at Foot, Brisbane Exhibition, 1921.

Chemistry.

ANALYSES OF FERTILISERS.

By J. C. BRUNNICH and A. F. BELL.

As the value of any **artificial fertiliser** depends entirely on the relative amounts of the principal constituents—**nitrogen, phosphoric acid, potash,** and **lime**—contained therein, it is customary to analyse samples of fertilisers on the local market from time to time.

For the protection of the farmers and fruitgrowers, Fertilisers Acts are framed, and as our Department found that "The Fertilisers Act of 1914" did not prevent the sale of inferior products, of very varying composition, as fertilisers, the powers under this Act were extended by "The Fertilisers Act Amendment Act of 1916."

The definition of "**Fertiliser**" under the combined Acts reads:—

> "Any substance or compound containing in appreciable quantity nitrogen, phosphoric acid, potash, or lime, manufactured, produced, or prepared in any manner for fertilising the soil or supplying nutriment to plants; also any excrement of animals or any natural substance or natural product which is used for fertilising the soil or supplying nutriment to plants: Provided that the term does not include farmyard manure, stable manure, seaweed, crude nightsoil."

It will be seen that now only such products as **stable** and **farmyard manure, crude nightsoil,** and **seaweed** may be sold as manures without guarantee of composition; any other crude product, or offal, if specially treated or not, will be classed as a fertiliser if sold for the purpose of fertilising the soil.

No person shall sell fertiliser unless he is **licensed** as a **dealer** under the Act.

Any person who desires to become licensed as a dealer shall apply in writing to the Minister for Agriculture and Stock, in the form of Schedule I. of the Act, and transmit the prescribed fee of one guinea. Such license has to be renewed annually.

As under the present amended Act lime and crude fertilisers are included, any person desiring to sell **lime, limestone, screenings, coral sand, sheep Manure, bat guano, ashes,** &c., to farmers for fertilising purposes must apply for a license.

On or before the 31st January in each year, every dealer shall deliver to the Under Secretary of the Department of Agriculture and Stock a **certificate,** in the form of Schedule III. of the Act, of the specified ingredients of each brand of fertiliser sold by him. Such statement may be amended at any time during the year.

Such **certificate** of **fertiliser** shall set forth the full name and place of business of the dealer, the name of the fertiliser, and the figure, or trade mark, or sign under which such fertiliser is sold, and a chemical analysis certifying that such fertiliser contains certain amounts of specified ingredients, and, in the case of bonedust or bonemeal, basic slag or Thomas's phosphate, air-slaked lime, agricultural lime, and gypsum, the percentage of fine and coarse material.

Upon the **sale** of any fertiliser, the dealer shall, at the time of sale or before delivery of the same, give to the buyer an **invoice certificate** signed by the seller or his agent, stating the full name and place of business of the dealer; the name, trade mark, brand, or sign used to mark packages containing such fertiliser and used to identify such fertiliser; the quantity or net weight of fertiliser comprised in the sale; the composition of the fertiliser, setting forth the proportion per centum in which such fertiliser contains the following ingredients:—Nitrogen, phosphoric acid, potash, and lime, and the respective forms in which they respectively occur ; and, in the case of bonedust, basic slag, agricultural lime, &c., the percentage of coarse and fine material.

Furthermore, every dealer who sells fertiliser, which term includes offering or exposing for sale and having in possession for sale, shall securely **affix** to each package a printed **label,** clearly and truly certifying:—The number of net pounds of fertiliser in the package; the figure, trade mark, or sign under which the fertiliser is sold; the chemical composition of the fertiliser, in the same manner as stated on invoice certificate; and the state of fineness for certain fertilisers.

A certain amount of **latitude** in the composition is allowed under the Act, in order to allow for slight variations in manufacture; and the **deficiency** between the amount of fertilising ingredient found and the amount guaranteed on the invoice and labels, must, in the case of nitrogen and potash, be now more than 5 per cent. or 1/20 of the total amount of nitrogen or potash certified to be present, and in the case of phosphoric acid and lime not more than 7 per cent. of the total amount.

On all schedules and labels the amounts of fertilising ingredients have to be stated in a uniform manner, as the old expressions—like bone phosphate, tricalcic phosphate, ammonia, ammonium sulphate, potassium sulphate, &c.—are liable to mislead the farmer. The Act provides for the statement of the valuable fertilising ingredients in percentage amounts of **Nitrogen** (N), **Potash** (K_2O), **Phosphoric Acid** (P_2O_5), **Lime** (CaO).

The **conversion** of the amount of **fertilising compound** into another is very simple, and, as many old manuring formulae still give the old denominations, we will herewith give a table which can be used for such calculation:—

Amount of—		Multiplied by—	Gives the Coresponding Amount of—
Ammonia	NH_3	0·824	Nitrogen, N
Ammonium sulphate	$(NH_4)_2SO_4$	0·212	Nitrogen, N
Sodium nitrate (Chili saltpetre)	$NaNO_3$	0·165	Nitrogen, N
Potassium nitrate (saltpetre)	KNO_3	0·139	Nitrogen, N
Nitrogen	N	1·214	Ammonia, NH_3
Nitrogen	N	4·714	Ammonia sulphate
Potassium sulphate	K_2SO_4	0·541	Potash, K_2O
Potassium chloride or muriate	KCl	0·631	Potash, K_2O
Potassium nitrate	KNO_3	0·466	Potash, K_2O
Potash	K_2O	1·850	Potassium sulphate
Tricalcic phosphate (bone phosphate)	$Ca_3P_2O_8$	0·458	Citrate insoluble
Monocalcic phosphate (superphosphate)	$CaH_4P_2O_8$	0·607	Water soluble Phosphoric acid P_2O_5
Tetracalcic phosphate	$Ca_4P_2O_9$	0·391	Citrate soluble
Limestone, marble	$CaCO_3$	0·560	Lime, CaO
Gypsum	$CaSO_4$	0·411	Lime, CaO

Lime may be used in several forms, and the amended Act provides for four classes—

(a) **Caustic lime,** or burnt lime, or quicklime, containing the lime in form of calcium oxide (CaO);

(b) **Mild lime** or air-slaked lime, containing the lime chiefly in form of hydrate of lime ($Ca(OH)_2$), obtained by slaking of burnt lime with water;

(c) **Agricultural lime,** containing lime in the form of carbonate of lime ($CaCO_3$), and obtained by crushing or pulverising of limestone, marble, coral, and shells;

(d) **Gypsum,** containing lime in the form of sulphate of lime ($CaSO_4$).

The action of lime in form of powdered quicklime or air-slaked lime is very rapid and powerful, and application is only recommended to very stiff clayey and very acid soils. The safest form is generally agricultural lime, but on account of its insolubility the limestone, in order to become gradually available, must be ground very finely, so that the largest percentage goes through a sieve with forty meshes to the linear inch or 1,600 meshes to the square inch.

In many cases a mixture of quicklime and crushed limestone is found particularly beneficial, combining the quick and slow actions of the two forms; and when, for instance, 1 ton of lime per acre is recommended to be applied, a mixture of 5 cwt. of air-slaked quicklime and 15 cwt. of crushed limestone or agricultural lime could be used.

With reference to **"Mixing of Fertilisers,"** a short article was published lately in the August number of this Journal.

The **monetary manurial value** per ton has been fixed for some time under "The Profiteering Prevention Act of 1920." The **unit values,** which are the cost price of 1 per centum of the various fertilising constituents per ton, or the actual cost value of every 22.4 lb. of such constituent, have been fixed as follows:—

Nitrogen—	s.	d.
In dried blood	26	0
In bone, flesh, and offal, fine	24	0
In bone, flesh, and offal, coarse	21	0
In bone, flesh, and offal, unspecified	17	0
In bone, flesh, and offal, unspecified lumps	14	0
In nitrate of soda	35	6
In ammonium sulphate	23	0

	s.	d.
Potash—		
In sulphate of potash	18	0
In muriate of potash	12	0
Phosphoric acid—		
As water soluble in superphosphate	9	3
As citrate soluble in basic superphosphate and Thomas's phosphate	9	0
As citrate soluble in finely ground island phosphate and guano	5	6
As bone, &c., fine	5	6
As bone, island phosphate, and guano, coarse	4	3
As finely ground mineral rock phosphate	4	3
As bone, island phosphate, guano, unspecified or unspecified lumps	3	0
Lime as ground lime carbonate	1	0

From these unit values the cost of any fertiliser may be calculated, and, for instance, the local cost of "Orchard Manure" No. 211, containing 2.7 per cent. nitrogen, 16.8 per cent. total phosphoric acid, of which 14.5 per cent. is water soluble and .8 per cent. citrate soluble, and 4.1 per cent. of potash, would be as follows:—

	£	s.	d.
2.7 per cent. nitrogen as ammonium sulphate, at 23s. ..	3	2	1
14.6 per cent. phosphoric acid as water soluble, at 9s. 3d. ..	6	15	1
.8 per cent. phosphoric acid as citrate soluble, at 5s. 6d.	0	4	5
1.4 per cent. phosphoric acid unspecified, at 3s.	0	4	2
4.1 per cent. potash as muriate, at 12s.	2	9	2
Mixing charge	1	0	0
	£13	14	11

In many cases specified charges for freight, rebagging, and retailing are allowed, and additional costs for fertilisers sold and manufactured north of Mackay.

A considerable reduction in these costs is to be expected shortly, and ammonium sulphate and also potash salts can be already imported from the South at lesser cost.

Any reduction in the cost of fertilisers is of vital importance to agriculture, in order to allow a much more extensive use. The proper use of fertiliser is fully explained in a little pamphlet, **"Complete Fertilisers for Farm and Orchard,"** which may be obtained on application from the Department of Agriculture and Stock.

We have numerous instances of the **excellent results** obtained by fertilising and liming soils, and it is interesting to record that, in spite of highly fertile lands available and in use for pineapple culture in Queensland, record crops were grown on comparatively poor sandy soils by judicious application of **lime** and **artificial fertilisers.** On the same farms timely application of certain nitrogenous fertilisers, recommended by us, to crops, which due to adverse climatic conditions were very backward and promising failure, produced immediate recovery and excellent yield.

Any farmer in doubt about the quality of fertiliser purchased should at once apply to the nearest inspector under the Act, in order to let him draw a sample and submit same for analysis. All inspectors appointed under "The Diseases in Stock Acts, 1896 to 1898," "The Diseases in Plants Act of 1896," "The Dairy Produce Acts, 1904-1911," and the expert and inspectors under "The Pure Seeds Acts of 1913 and 1914" are officers under the Fertilisers Act.

Under the Fertilisers Act samples of the various fertilisers on the market were obtained and analysed. The results are given in the following table, and in the few cases where **deficiencies** in the fertilising ingredients were found the **values are printed in heavy type.**

We also give a table showing the fertilising value of **wood and plant ashes.** It will be noticed that the actual percentages of ash obtained in most cases are very small, and that the ashes of most of our timbers contain large amounts of lime. From prickly-pear we get an average of about 2 per cent. of crude ash, which contains 9.5 per cent. of potash, so that 1 ton of our ordinary pest pear would yield about 4 lb. of potash if all the ash could be collected.

A table giving the manurial value of the **excreta** of the different **animals,** and also of the materials commonly used as **litter,** &c., is added for general information.

Analyses of Fertilisers.

Lab. No.	Fertiliser.	Where Obtained.	Nitrogen, N.		Phosphoric Acid P_2O_5.						Potash, K_2O.		Fine.	Coarse.
					Total.		Water Soluble.		Citrate Soluble.					
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	%
190	Dried blood	Q.M.E. Coy.	12·2	11·8	..	..	..	..	..	..	..	..	..	..
191	ditto	A.M.E. Coy. (225)	12·7	13·0	..	..	..	..	..	..	..	..	..	..
192	ditto	A.M.E. Coy. (168)	12·3	13·0	..	..	..	..	..	..	..	..	..	..
193	ditto	Birt and Co.	12·5	12·9	..	..	..	..	..	..	..	..	..	..
194	ditto	Aust. Co-op. Fert.	12·0	12·0	1·8	1·5	..	..	..	..	..	..	..	..
184	Fertiliser	J. C. Hutton	4·7	5·0	17·3	14·5	3·7	4·0	..	..	..	..	..	..
185	ditto	Q. Co-op. Bacon Coy.	5·0	4·7	13·9	17·6	..	..	..	..	..	..	..	..
186	ditto	Birt and Co.	5·4	5·0	16·3	17·1	..	..	..	..	..	..	..	..
187	ditto	Baynes Bros.	4·8	4·8	17·2	18·5	..	..	..	..	..	..	..	..
188	ditto	A.M.E. Coy.	6·3	6·5	12·6	11·0	..	..	..	..	..	..	..	..
189	ditto	Foggitt, Jones	4·3	4·3	17·2	17·9	..	..	..	..	..	..	..	..
195	Natural guano	State Produce Agency	·3	·15	13·3	12·0	..	..	..	..	1·1	·5	..	..
196	Holbourne Island (Phosphate, &c.)	Aust. Co-op. Fert.	..	..	22·1	17·0	..	..	10·4	8·0	..	..	..	..
197	Bonemeal	A.M.E. Coy.	3·7	3·5	24·6	25·0	..	..	..	..	..	..	32·8	67·2
198	ditto	A.C.F. (Jordan's)	3·2	3·5	25·2	21·0	..	..	..	..	..	..	26·8	73·2
199	ditto	A.C.F. (Runcorn)	3·4	3·7	26·0	22·0	..	..	..	..	..	..	28·7	71·3
200	ditto	H. A. Petersen	3·3	3·8	24·8	24·0	..	..	..	..	..	..	21·8	78·2
201	ditto	E. A. Jordan	3·2	3·8	23·6	24·0	..	..	..	..	..	..	30·5	69·5
202	ditto	Webster and Co.	3·4	3·1	25·2	24·0	..	..	..	..	..	..	33·4	66·6
203	Ammonia sulphate	Aust. Co-op. Fert.	21·1	21·0	..	..	..	..	..	..	..	..	..	..
204	ditto	N.Z.L. and M. Agency	20·0	20·0	..	..	..	..	..	..	..	..	..	..
205	ditto	Webster and Co.	20·9	20·0	..	..	..	..	..	..	..	..	..	..
206	ditto	Brisbane Gas Coy.	21·1	21·1	..	..	..	..	..	..	..	..	..	..
209	Nitrate of soda	Aust. Co-op. Fert.	16·5	15·5	..	..	..	..	..	..	..	..	..	..
207	Muriate of potash	ditto	..	..	..	..	..	..	..	..	57·6	53	..	..
208	Superphosphate	ditto	..	..	21·7	18·0	19·8	17·0	..	·5	..	..	..	..
210	ditto	N.Z.L. and M. Agency	..	..	22·5	18·0	19·8	17·0	..	·5	..	..	..	..
211	Orchard	ditto	2·7	2·3	16·8	14·5	14·6	13·0	·8	·8	4·1	4·5	..	..
212	Bone and super.	ditto	2·2	1·5	23·2	19·0	8·4	8·5	5·4	2·5	..	..	..	..
213	Special orchard	ditto	2·7	2·3	15·3	12·8	13·4	12·0	·9	·4	8·1	7·3	..	..
216	Superphosphate	Paul and Gray	..	..	24·1	..	20·1	17·0	..	..	..	..	..	..

Analyses of Wood and Plant Ashes.

—	—	Per cent. of Crude Ash in Wood or Plant.	IN CRUDE ASH: Per cent. Phosphoric Acid.	Per cent. Potash.	Per cent. Lime.
Apple-tree (*Angophora*)	..	..	·3	4·5	29·9
Banana plant (Cavendish) ..	Buderim ..	1·3	1·5	36·6	21·3
Belar	..	..	·02	4·9	49·1
Blackbutt (*Eucal. pilularis*) ..	Yandina ..	·1	2·7	15·9	14·4
Bloodwood, red (*Eucal. corymbosa*)	ditto ..	·08	2·0	12·7	12·5
Ditto	Bunya ..	·07	5·0	13·3	17·8
Blue gum (*Eucal. tereticornis*) ..	ditto ..	·13	14·0	9·1	19·2
Bottle-tree (*Sterculia rupestris*) ..	..	2·0	·2	29·0	23·5
Brigalow (*Acacia harpophylla*) ..	..	..	..	·9	54·4
Bumpy ash (*Flindersia Schottiana*)	..	·5	2·2	20·5	51·9
Camphor laurel	Brisbane ..	1·0	6·3	36·3	23·0
Cedar, red (*Cedrela australis*) ..	..	·8	9·4	19·7	39·2
Cotton, pods	..	5·3	2·2	29·9	8·3
Crow's foot elm	Atherton ..	..	6·2	5·8	46·9
Forest oak (*Casuarina torulosa*) ..	..	·4	1·6	11·9	64·6
Gidgea (*Acacia homalophylla*) ..	..	..	·9	1·1	48·7
Grey gum (*Eucal. propinqua*) ..	Bunya ..	·2	6·5	11·4	28·9
Hoop pine (*Auracaria Cunningh.*)	Ipswich ..	·7	1·0	17·9	48·7
Ironbark, red (*Eucal. siderophloia*)	Bunya ..	·08	3·9	6·4	22·8
Lantana (whole shrub)	..	..	3·6	14·0	17·0
Lantana (leaves and twigs) ..	..	..	3·5	11·8	11·5
Mangrove (leaves and twigs) ..	Russell Isl.	..	2·0	8·1	16·0
Mangrove (leaves and twigs) ..	Sandgate ..	..	2·1	4·4	12·3
Mangrove (black)	Cairns ..	..	·6	1·3	35·9
Nettlewood	Crow's Nest	3·4	4·1	6·5	28·1
Oregon pine	..	·8	·5	1·3	29·1
Pineapple, whole plant, rough and smooth	Nundah, &c.	1·1 to 2·6	2·2 to 6·0	9·3 to 15·0	5·8 to 7·0
Prickly-pear (*Opuntia inermis*) ..	Dulacca ..	1·2 to 2·6	·5	9·5	19·9
Red stringy bark (*Eucal. resinifera*)	Yandina ..	·05	·8	9·2	17·3
Sawmill ashes (chiefly pine) ..	..	..	1·1	8·7	34·1
Sawmill ashes (chiefly hardwood)	..	..	·6	1·9	29·3
Scrub box (*Tristania conferta*) ..	Yandina ..	·8	·3	7·9	31·1
Sisal hemp	Isis ..	..	4·6	8·0	31·9
Stinking Rodger (*Tagetes glandulifera*)	Maroochy ..	2·6	15·8	20·0	27·2
Sugar-cane tops	..	1·5	4·9	13·0	6·8
Sugar-cane trash	..	6·6	3·2	4·9	4·0
Tallowwood (*Eucal. microcorys*) ..	Yandina ..	·2	·4	2·4	52·2
Tobacco plant	..	..	5·4	27·1	40·7
Turpentine (*Sincarpus laurifolia*)	Yandina ..	·4	·4	1·2	1·9
Yellow stringybark (*Eucal. œmenoides*)	Bunya ..	·06	2·1	9·5	9·5

Composition of Excreta and Litter.

	PERCENTAGE OF :					
	Water.	Organic Matter.	Nitrogen.	Total Ash.	Phosphoric Acid.	Potash.
Horse dung	75·8	21	·5	3·2	·3	·4
Horse urine	90·0	7	1·5	3·0	trace	1·6
Cow dung	83·5	14·6	·29	1·9	·2	·1
Cow urine	93·8	3·2	·6	3·0	trace	1·3
Sheep dung	65·5	31·4	·6	3·1	·3	·2
Sheep urine	87·5	8	1·9	4·5	trace	2·3
Pig dung	79 to 84	10 to 15	·4 to ·7	3 to 5	·1 to ·4	·3
Pig urine	97·5	1·5 to 2·8	·4	1 to 1·5	·1	·7 to ·8
Hen manure	59·7	29·4	·8 to 1·6	8·4	·5 to 1·5	·6 to ·9
Litter—						
Straw (cereal) ..	12 to 21	75 to 83	·3 to ·9	3 to 8	·2 to ·3	·5 to 1·1
Straw (leguminous)	12 to 22	76 to 83	1·2 to 2·0	3 to 9	·3 to ·4	·6 to 1·8
Leaves, dry ..	13 to 15	78 to 81	·8 to 1·4	4 to 6	·2 to ·3	·2 to ·4
Sawdust	32·5	62·3	·8 to 1·0	·3 to 2	·05	·10
Tannery refuse	6·4	33·8	·2	..	·04	·08
Human excreta ..	77·2	13	1·0	3·0	1·1	·25
Human urine	95·9	4	·6	1·0	·17	·20

Photo. Live Stock Bulletin.]

PLATE 74.—SEGIS PIETERTJE PROSPECT.

An American Friesian, the new World's Champion Milk Producer. Official test figures at age of 6 years :—1 year, 37,384 lb. milk, yielding 1,445·9 lb. butter ; 7 days, 33·18 lb. butter.

CATERPILLAR PLAGUE.*

(*Leucania unipuncta*, Haw.)

By HENRY TRYON, Entomologist.

(PLATES 75, 76, and 77.)

INTRODUCTORY.

AT two periods of the year—September-October and March-May—reference may be found in the Press to serious ravages committed on pasturage and cereal crops by caterpillars. These caterpillars are the young of two night-flying moths, known, respectively, as *Leucania unipuncta*, Haw. (*extranea*, Gn.) and *Spodoptera mauritia*, Boisd.† Of these, the former is the insect that is generally concerned, and is the one to which subsequent remarks will be confined.

This insect is one whose range of occurrence is very extended, being met with, according to E. Meyrick, not only in Australia and New Zealand, but also in Europe, Southern Asia, and North America. In the last-mentioned region it bears the significant name of "army worm."

As a caterpillar, a chrysalis, or a moth, it is to be observed in districts that it affects throughout the year in varying degrees of prevalence. It has many enemies. Not only do birds devour it, but it is the prey also of many carnivorous insects. It is, however, most effectually held in check by internal parasites and disease—both fungus and bacterial; and, moreover, special meteorological conditions determine the death of its eggs. Under ordinary circumstances these factors prove competent to hold it entirely in subjection; and it is only when, under conditions that are not fully understood, their operation is temporarily suspended, that a caterpillar plague manifests itself. The occurrence of the insect in formidable numbers is also the occasion for its enemies to assert their fullest influence. Hence it usually happens that a district is rarely visited in successive seasons by this pest, and, indeed, years may sometimes elapse between one visitation and another.

NATURE OF INJURY.

The caterpillars consume the foliage and stems of various species of native grasses, also those of introduced kinds—such as Panicum and Prairie (*Bromus unioloides*)—grown for hay or other purposes. They also devour oats, rye, barley, wheat, maize, sorghum, and possibly young sugar-cane; and will sustain themselves by nibbling, and so damaging, the shoots of lucerne, and even those of the potato. In the case of wheat

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* This is a reprint of an article that appeared in the *Queensland Agricultural Journal* for February, 1900, *op. cit.*, volume VI., page 135-147, and is issued as relating to a subject of interest at this time of the year.—ED.

† The insect is distinct from *S. acronyctoides*, Guen., of which *S. mauritia* (Boisd.) is a synonym. Hampson in 1909 named it *Laphygma leucophlebia*, Hmps.

not only is the flag consumed but the spikelets of the head may be eaten right back to the rachis, as is represented on Plate 75. Rye in ear they will simply strip of every leaf, the bare stalks and heads alone remaining. Should the cereal not have already flowered, it may be eaten down to the ground: a remark that especially applies to young maize, no vestige of which may remain after caterpillars have passed over a field devoted to this crop. When young wheat has already been cut and tied up, the caterpillars may even eat the top of the shooks back for several inches. And when exceptionally the growth is sufficiently advanced at the time of their visitation, for the crop, after cutting, to be dried for hay without risk of heating, it may be found that it has already become so soiled by the dead bodies of the marauders as to be wholly rejected by the animals to which it is presented, either in the form of chaff or otherwise. Their destructive action, moreover, is not only thorough but it is also extensive. In the district of Ma Ma Creek, quite 200 acres were seriously damaged or destroyed by this pest during September, 1899; and on the Darling Downs caterpillars rendered single plots of barley and wheat, 100 acres in extent, not even available for straw.

THE INSECT.

The special depredator referred to as *Leucania unipuncta* occurs under four different phases or conditions, viz.:—The Moth, the Egg, the Caterpillar, and the Chrysalis.

The Moth (*vide* Plate 76, Figs. 1 and 2).—Generally speaking, the moth is clay or fawn coloured, with the forewings—of this colour—very thickly speckled with black, and having a minute white spot in their centres, and the hindwings, that are paler outwardly, blackish-brown. It may measure nearly 2 inches across the wings. The following more detailed description is taken from one of the writer's previous memoirs:—

"*Male.*—Fawn-coloured. When undisturbed the wings are directed backwards behind the body, so as to make an angle one with the other. Their surfaces are inclined, and their outer borders when in this position leave an angle between them. The eyes are brown, large (and hairy). There is a frontal tuft of brown black-tipped scales between the latter; the antennæ are minutely ciliated (in the males). The body is stout and tapers towards the tail, that is terminally tufted. The thorax is clothed with fawn-coloured hairs, and has a faint yellow dark-edged transverse stripe on the forepart between the anterior wings, and two oblique rows of black points on the hinder portion, meeting at an angle on the middle line. The abdomen is lighter brown, and without crests. The forewings are elongated, their anterior margin is straight, and their external slightly oblique. Each has a dark discal spot, containing a white point, anterior to which is a light-chestnut suffusion; a short oblique subapical brown streak; a line on the outer margin, and an exterior transverse one, of black points; internal to the latter line and between it and the discal spot is an interrupted waved brown stripe, often scarcely discernible. Hindwing short, broad with apex rounded, and external margin undulated; grey, passing into dark cinereous towards outer border (very distinct beneath); anterior border, yellowish-white; cilia, light-yellowish white. Beneath lighter coloured than above; a longitudinal line containing a few distinct black spots on each side of the abdomen; front border and outer portion of forewings, and fore border of hindwings, with light-black speckled scales; a cloud of dark cinereous colour across the outer third of forewing. Legs light-grey with black specks; fore tibiæ with two and hind tibiæ with four spurs. Extreme length when undisturbed, $\frac{4}{5}$ inch; expanse of wings, $1\frac{3}{5}$ inch; length of body, $\frac{3}{10}$ inch."—*Insect and Fungus Pests*, page 224: Brisbane, 1889.

Egg.—The eggs are spherical, somewhat flattened above, and measure about $\frac{1}{50}$ inch in diameter. Their surface is symmetrically rugose, but this feature is generally obscured by certain sticky matter with which they are covered at the time of their being laid. They are yellowish-

white in colour, but darken with age. (The accompanying figure (1) displays eggs, of nearly natural size, *in situ* on the plant, and their appearance when magnified.)

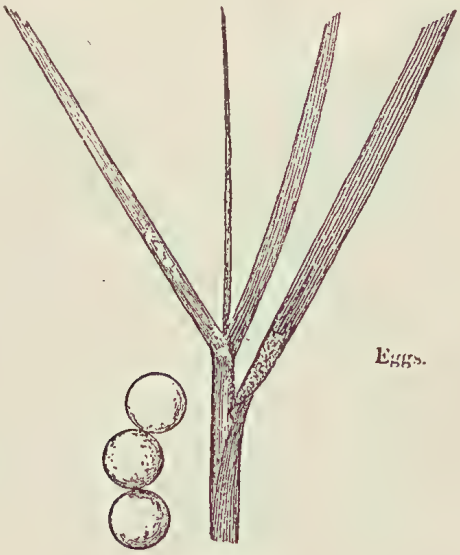

Fig. 1.

The Caterpillar (Plate 76, Fig. 4).—The caterpillars attain a length of 1½ inches and are nearly ¼-inch in diameter. They vary in colour with age. Thus, when newly hatched, they are translucent and almost white; then they acquire a greenish tinge, and later they become darker and have stripes that extend along the sides of their bodies. Still later, when about to become chrysalises, they are lighter coloured again, and meanwhile the stripes have changed to a paler hue. There are also dark and light varieties of the same age. The following detailed description will serve to more definitely define the characteristic features of the insect:—

A smooth-surfaced caterpillar, with a cylindrical body gradually narrowed towards the head, more suddenly towards the tail; the twelfth segment without transverse keel above. The mandibles brown bordered with black; the labrum is sinuated anteriorly and whitish; the anterior clypeus is longitudinally wrinkled; the posterior clypeus has a few transverse fine striæ, and is white with a central longitudinal brown mark, or is brown with a white border; top and sides of the head netted white and brown; prothoracic plate (shield behind the head), dark-brown, remainder of body greyish-brown (under the lens appearing mottled-brown on a white ground); thoracic legs, whitish with brown claws; abdominal prolegs, white, each with a transverse broad smoke-coloured band on its outer surface; spiracles, black (under-surface greenish, grey at the sides); two light-yellow broad stripes extend on each side of the back from the fore-border of the prothoracic plate, and are irregularly edged with black above; midway between them, along the centre of the back, is a third stripe of the same colour; this is usually interrupted and very indistinct. Below the dorso-lateral stripes are two bands on each side extending the whole length of the insect—one is along its inferior border contiguous to the spiracles, and the other is below their level. The latter is the more conspicuous, being cream-coloured with the central area mottled with light red. There are a few slightly raised hair-bearing black points on each segment. These number twelve on a segment in the mid-region of the body, the six on each side being disposed as follows:—One above the dorso-lateral line, one in it, one above the spiracle, one below it and on its side, and one at the base of the abdominal proleg. Length of caterpillar, 1½ inches."—*H. Tryon, op. cit.*, page 225.

The Chrysalis (Plate 76, Fig. 3).—This is of the form represented in the figure referred to. At first light-brown, it soon assumes a rich dark reddish-brown colour. It is smooth and shining, and when fully extended measures about $\frac{4}{5}$ inch in length. The three anterior segments, that correspond to the hind body of the future moth, have each on the forepart a row of punctures between the breathing pores (spiracles), and the terminal segment ends in two nearly parallel sharp depressed spines.

HABITS OF INSECT.

The moth, under natural circumstances, is nocturnal in its habits, preferring the early part of the night for its movements. It will, however, take wing during any time of the day, even during the prevalence of bright sunshine, when disturbed. Amongst disturbing agents may be mentioned the wind, especially should the moth emerge from its chrysalis in an exposed spot. Under this circumstance, also, it follows its direction with rapid movement, after taking wing with great suddenness. Whilst engaged in flight it usually passes near the surface of the ground, except during the night, when it may wend its way at a height of some feet therefrom. In settling down it runs quickly to some hiding-place, especially selecting such as presents colouration in harmony with that of its own livery. It feeds upon the nectar of flowers. Some few days may elapse between the emergence of the moth from its chrysalis in the ground and the laying of its eggs. During this interval it conceals itself by day in any vegetable *débris,* sticks, grass, boards, &c., that may be met with in its immediate environment. But it goes forth night after night to feed, many kinds of flowers affording it sustenance. Each female moth—as has been ascertained by other observers—lays from 500 to 700 eggs. The site usually chosen for their reception is afforded by young leafy shoots of some rank growing grass, or of a cereal before any appearance of the flowering-stalk has arisen, especially when thickly sown and each plant resembles a small tussock. In selecting the spot for the reception of its eggs, the parent insect seems to anticipate the requirements of its young, which are protection from light and an abundance of succulent foliage. It, however, prefers that the plant should have arrived at a certain definite stage of growth, choosing such amongst others that, though adjacent, have evinced a less rapid development. This was very noticeable in different stud wheats grown at the Hermitage State Farm in rows side by side and sown at the same time. In this instance such late varieties as Windsor Forest, New White Queen, Selected Square Head, Challenge White, and White Nursery were free from their attacks, whilst other more quickly maturing kinds growing near them were attacked, amongst which latter may be mentioned Allora Spring, Budd's Early, and Gayndah No. 4. The moth usually selects the leaf-sheath, or the spot where the flag comes away from the stem, as the site for its eggs. "When the female moth finds a stalk of grain or grass suited for her purpose, she clasps it with her legs, and thrusts her ovipositor into the unfolded base of the leaf or down into the sheath, where it surrounds the stalk" (*F. M. Webster*). Many eggs are laid together in one position at the same time (*vide* fig. 1, page 333). They are placed side by side in linear series of 20 or more, and enveloped in a sticky substance that causes them to remain adherent to the leaf surface on which they are placed and to one another. C. V. Riley states that exceptionally these are laid "in the cut straw of old stacks, or in hayricks, or even in pieces of cornstalk in the field, or in stubble." These eggs, under favourable circumstances, hatch in about a week or fifteen days. The minute caterpillars on hatching out feed

at first on the shell of the egg whence they have arisen, then on their leafy surroundings at the base of the flags, after which they enter the innermost recesses of the plant (whence they may be shaken out), or even rest immediately beneath it. During this time they inflict no noticeable injury, so that their presence may not even be suspected. Both now and at a later period in their growth, the caterpillars feed almost wholly at night, especially during bright sunny weather. When, however, rain prevails and the weather is overcast, they may crawl to the most exposed portions of the plants whereon they occur, and feed there continuously (they will also similarly remain exposed when victimised by insect or parasites or by disease). When disturbed, they immediately drop from where they were previously feeding—the very young by a thread, the older without any. Having fallen, they quickly roll themselves up with the head inwards, and remain motionless, but after a minute or two they bestir themselves, and soon crawl away. Should the plant on which they feed be isolated or offer little concealment, they spend the day concealed in the nearest hiding-place they can find, as under a stone or piece of wood; also when crawling from place to place they will rest hidden beneath clods of earth or in such like places. When disturbed, especially in cloudy weather, they will frequently, whilst resting on their abdominal prolegs, elevate the fore-part of their body, and move their head to and fro with sudden jerks. This also is their habit when attacked by insect parasites, and with the presence of these they probably instinctively associate every threatening danger. When developed to a third of their ultimate size or more, they may travel extensively from plant to plant during the hours of darkness. But when more fully grown they may supplement these nocturnal excursions by much more general ones pursued during the time daylight prevails. Referring to one of these excursions, Mr. G. Anderson, of Oakey Creek, informed the writer as follows:—"The caterpillars appeared to occur throughout 70 acres of barley simultaneously. They were in immense numbers. For three days they were upon the move between the hours of 12 and 3 on each occasion, the moving mass —for such was the appearance, due to their numbers—travelling west." The *Brisbane Courier* of 22nd March, 1898, referring to an occurrence of caterpillars in the Laidley district, stated also as follows:—"Some parts of the district are being ravaged by immense armies of caterpillars that march along and eat up grass, panicum, and even tackle the maize. Some farms in their track have been completely devastated." When in the course of these general movements they have occasion to cross land not occupied by the plants to which they are especially partial, they will nibble others, and so injure them to a greater or less extent. Thus all the shoots of lucerne were seen to be destroyed in one instance in the Ma Ma Creek district; in another case nearly all the young haulms of a considerable acreage of potatoes had been gnawn down. As a rule it is not until the caterpillars are nearly full grown that attention is directed to their presence, which happens then by reason of the extent of their depredations ("the crop looking thin," as is often said) or the occurrence of such a moving host as has been alluded to.

The caterpillar takes from four to five weeks to mature, but this period is subject to variation in length, a circumstance connected with the amount of suitable food that is available for its consumption, as well as the occurrence or absence of congenial climatic conditions. Thus, during the winter, the insect will persist as a caterpillar for quite three months, during a portion of which time it remains in a semi-dormant condition.

When mature, it changes, as previously remarked, to a lighter colour, and its stripes grow paler. It then, under normal conditions, enters the ground to a depth of about 2 inches. Here, still outwardly a caterpillar, it becomes even paler in colour than before, and its body meanwhile becomes considerably shortened. In this position it may remain for two days (this period is also subject to variations in length), during which time, by special movements in different directions, it forms an oblong smooth chamber measuring about 1 inch in length, and meanwhile changes into a chrysalis such as has been described. In exceptional cases, however, it crawls beneath a stone, piece of fallen timber, sod of earth, or "land" in ploughed ground, and then transforms without constructing any chamber, though sometimes it covers itself with earth.

The insect having thus passed into a chrysalis remains in that condition usually for about two weeks; but again the time passed in this phase may vary from ten days to three or four weeks. At the expiration of this period the perfect insect or moth arises, a warm evening after rain being usually chosen for its appearance.

Although the caterpillars occurring even in the same field exhibit great variation in size and consequently in age, there are good grounds for concluding that, generally speaking, there are at least three broods, if not four, every year, although it is only during two periods of the year—September-October and March-April—that they occur of such extent as to prove noticeably destructive; their comparative smallness in the intervening periods being due to the operation of natural checks upon their growth and increase, as well as to the condition of growing crops. These three or four separate broods, however, overlap to a considerable degree. The caterpillars that were observed during 1899 in the Ma Ma Creek district from the second week in August onwards, and which had already transformed—in part—to moths by the third week of September, were no doubt derived from moths that had deposited their eggs, where these caterpillars were met with, in May. It was inferred that a similar state of things had obtained on the Darling Downs, since, in many instances, whereas wheat sown in April or May was subsequently attacked by caterpillars, that which had been planted in the same locality in June and July had escaped their visitation; a remark that also applied to both oats and barley. Where it had been otherwise, there was generally evidence forthcoming to point to a migration of caterpillars from the earlier to the later sown crop. The explanation of this is to be found in the fact that the crops, in order to evince the presence of caterpillars in September, require an access of the moths in May. If this is impracticable, they may escape their presence.

NATURAL ENEMIES.

It has already been stated in the introductory paragraph that under normal conditions the caterpillars of *Leucania unipuncta,* Haw., do not occur in such numbers as to inflict noticeable damage to pasturage, cereal, or hay crops. It is also true that when, under special circumstances, these pests have exceeded these limits in respect to numbers, forces come into operation to restore the balance of Nature by checking the enormous numerical development of these caterpillars that would follow the free exercise of their powers of increase. This experience results from the operations of so-called natural enemies, in which category may be included not only predatory birds and other insects that find sustenance in preying upon their bodies, but parasitic forms of life to which the bodies of these caterpillars serve in the general capacity of host, providing at the same time not only aliment but

dwelling-place also. As an instance of this, a plague of caterpillars caused some consternation by reason of its ravages in the district immediately to the south of Brisbane during March, 1895. The immediate descendants of these marauders still exist, a score of generations having succeeded one another since then; and yet we have learnt of no further trouble from caterpillars in the districts alluded to. But that this would be so was predicted by the writer at the time, after having remarked the extent to which parasitic insects had victimised these grubs concerned in the ravages complained of. And, in addition to the insect parasites, there are also certain fungi (Entomophthoreæ) and bacteria that produce general and fatal disease in the course, too, of their parasitic life in the tissues of these insects.

In the case of the visitations of caterpillars in September-October, 1899, that have suggested the preparation of this article, similar checks on increase were also operative, and no doubt in consequence similar beneficial results to those above alluded to will follow in most of the localities that have suffered. In the present instance parasitic insects were principally concerned, and amongst these the following are worthy of being especially mentioned:—

A.—Insect Parasites.

Theronia rufipes, sp. nov. The Red Ichneumon. (Plate 77, Fig. 2).—This is a deep-red and glossy insect, having smoke-coloured wings that appear steel-blue in certain lights, and the anterior two-thirds of its hind body black and conspicuously spotted with a row of large white spots along each side. Very large female examples may be 11 lines in length, and have a wing spread of nearly 1½ inches, but as a rule in this sex their measurements are respectively 8 lines and 1 inch. These insects during overcast weather may be seen to alight on and explore in plants that are frequented by caterpillars; but it is during the prevalence of hot sunshine that they occur in greater numbers, though their extreme activity then often leads to their being overlooked. At this time, however, they may be remarked, passing rapidly to and fro just above the surface of the grass or cereal crop, ever and anon suddenly alighting and creeping amongst the herbage. Even at nightfall they are still at their posts, remaining three or four together stationary on the grass stems. On discovering a caterpillar they soon settle upon it after exploring it from all sides with their feelers, and notwithstanding the violent contortions into which it throws its head and body. Then they probe it deeply with their black needle-like ovipositor (composed of three separable parts and measuring ⅓-inch in length), and so place within its body one or more of their eggs. It is probably also that at the same time they either disperse in the air or inject into the tissue of their victim a fluid analogous to formic acid that they secrete, and that may serve the purpose either of an anæsthetic or preservative. One, at least, of the eggs of the ichneumon thus inserted hatches into a maggot that feeds within the caterpillar, and continues to develop as the growth of the latter is still continued; but at the same time it avoids touching organs the injury of which would result in speedy death.

Meanwhile, the caterpillar enters the ground, and, in the majority of instances, transforms to a chrysalis. Further transformation on its part is, however, restrained, for, instead of a moth emerging from the ground, there issues the red-bodied ichneumon fly, which digs its way to the surface through a small circular hole, that is sufficiently large to be readily perceived.

In the case of some chrysalises of grass-feeding caterpillars (*Laphygma leucophlebia*) obtained during April, 1895, in the Tingalpa district, through the instrumentality of Mr. A. Grieve, it was remarked that, with the exception of an exceedingly small percentage, all gave birth to these parasites in lieu of moths.

It is, however, in attacking belated caterpillars that these ichneumons are most serviceable. When the *Theronias* emerge from the bodies of their hosts there are always a few caterpillars that have not as yet transformed to chrysalises. These, however, the female ichneumons search out with great pertinacity, and so ultimately destroy. Their presence in numbers on pasturages previously visited by caterpillars is often remarked by graziers, who are led to question the significance of this phenomenon. This happened in the case of the caterpillar plague at Rockville, Mombra, in 1896 (*T. Nicholson*). Mr. A. Grieve, in the instance above quoted, drew attention to the fact that the ichneumons that were hatching out under his observation were nearly all males—a fact that subsequently received corroboration from the experience of the writer. In this instance, moreover, it did not appear that it was a case of protandry, as has been noticed in the case of the related insect, *Pimpla inquisitor*, Say., by C. O. Howard in the United States. "With this species" he remarks ("Study on Insect Parasitism," page 13), "as with so many other parasitic Hymenoptera, and indeed as with so many other insects in general, there was a marked priority in the issue of the males." He then gives a tabulated statement showing that male *P. inquisitor* were appearing for seven successive days prior to the emergence of any female examples of the species.

As this insect does not appear to have been described and is of great economic interest, the following technical description is appended to ensure its correct identification:—

Theronia rufipes, sp. nov.—*Female*: Red, four anterior segments of hindbody, deep bluish black, each with a large ovate white spot on the side adjacent to the hind border, forming a lateral longitudinal series. Wings, fuliginous the fore ones having dark steel-blue reflections, especially towards the base; antennæ outwardly, tarsus of hind legs and ovipositor fuscous. Altogether smooth and glossy. Hindbody impunctate. Head and thorax very faintly punctured. *Head* not lengthened, with straight fore-border; antennæ situated in a broad shallow concavity, eyes excavated opposite the origin of these; vertex narrow with rather sudden occipital slope. *Thorax*, mesonotum without wrinkles; scutellum convex with two lateral keels enclosing a triangular space; meta-thorax wrinkled transversely, and with a central ridge ending in an obtuse tubercle beyond which it is obliquely truncated, two dorso-lateral tuberosities on the margin of the hinder slope form a triangle with the preceding one, meta-thoracic spiracles oblong. *Wings*, pale fuscous, with the stigma and veins black, the latter becoming paler outwardly; areola present, four-sided, the two transverse cubital nerves bounding its meeting on the radial. *Legs*, coxa of hind legs very large, their femora thickened with a tooth on the lower surface behind the middle, middle and hind tibiæ spurred, and with each two terminal spines, claws stout, simple. *Abdomen*, 1st segment oblique, truncated anteriorly; 2nd, 3rd, 4th, and 5th segments with a lateral impression immediatesy above the spiracles extending backwards and outwards; that of the 5th obsolete beyond the base; immediately above this impression, and in front of the white lateral spot on the 2nd, 3rd, and 4th segments is a small tympanum-like spot (*lunula* of Foerster), round on the 2nd segment, oblong on the others; hind border of segments 6 and 7 with deep-rounded excavation extending forwards half the length. *Ovipositor*, $\frac{3}{4}$th length of abdomen. Length (excl. ovipositor) 17 mm.; wing expansion, 28 mm. *Male*: Smaller, five abdominal segments white-spotted, 1st having two on each side (therefore lateral series 6 instead of 4 as in female). Vertex except sides, and occiput except orbital border of eyes; sides of scutellum, and frenum black; scutellum and frenum with raised yellow border.

Exephanes leucaniæ, sp. nov. (Ichneumonidæ.) Plate 77, Fig. 3.) —This ichneumon is a dark-coloured insect, measuring about $\frac{1}{12}$th inch long, having a long band on the hind body; the feelers and legs red;

also several white spots on the thorax present. With regard to it, it may be affirmed that observations point to the conclusion that it does not occur in such numbers as do the other hymenopterous parasites described, but still it was met with on the Darling Downs in such numbers as to indicate that considerable services in checking the increase of the caterpillar moth was being exerted by it. With reference to its movements, it may be stated that it is a far less active insect than is the more prevalent Red Theronia. Only male examples have been reared from victimised caterpillars; but its systematic relations are sufficient evidence that its consort will prove to have a relatively short ovipositor. Probably not more than a single *Exephanes* grub reaches maturity within the body of its caterpillar host. No species of *Exephanes* existing in Australia appears to have been hitherto described. It may be thus characterised:—

Male. Exephanes leucaniæ, sp. nov. Black; antennæ (except two basal joints), labial palps, legs (except coxæ and trochanters of all and special bands on hind legs), 2nd abdominal segment, and 3rd beneath, basal $\frac{2}{3}$ of costa and stigma of forewings horn-yellow to red; front and clypeus (except a triangular patch in the centre), anterior surface of basal joint of antennæ, prothorax above, scutellum, a spot on each side of metathorax behind, two spots at root of forewing, a large spot on the inner aspect of the trochanter of each leg, a lateral spot at the extremity of the 1st joint of the abdomen, pale yellow; hind border of 3rd abdominal segment, wide band on hind border of 4th, and 5th on each side (bands not meeting above) and hind border of 6th, white. Antennæ fuscous towards extremities; tarsi (except proximal $\frac{2}{3}$rds of 1st joint), a broad band at extremity of both tibia and femur of hindlegs black. Entire surface thimble-punctured, frenum and metathorax above rugose; for the most part covered with fine whitish hair. Lower surface of abdomen glossy, otherwise dull. *Thorax* with scutellum evenly convex, separated from mesothorax by a wide smooth sulcus closed on each side by a sharp keel, that borders the mesothorax laterally; metathorax with rounded antero-posterior contour, with a sudden posterior declivity, and with four smooth longitudinal keels proceeding backwards from foreborder, the two lateral ones just above the slit-like spiracles becoming soon obsolete, the two dorsal ones united to the foregoing by transverse keels extending some way down hinder declivity; the latter also enclose a space that is divided into three areas by transverse keels, whereof the anterior one widens in front, and the middle one is square. *Abdomen*, petiole of 1st joint with a low narrow keel on each side beneath, and a dorsal one on each side above the spiracle; 2nd segment with large wrinkled depression on each side adjacent to the fore-border. *Wings* with areola well-marked, the transverse cubital veins, forming it, separated at origin on radial. Discoidal transverse, or 2nd recurrent, with a projection outwards in the middle of its length, a projection inwards also at origin of cubital vein; veins of forewing (except costa and stigma), blackish. Length, 15 mm.; expanse of wings, 23 mm.

3. *Paniscus* (*productus*, Brullé?). [Fam. Ophionoidæ.] (Plate 77, Fig. 4.) This is a large yellowish-brown clear-winged insect, having the hinder body, that is usually held in an arched position, compressed from side to side and widened towards its extremity. It measures nearly 1 inch in length, and has a wing expansion of $1\frac{1}{4}$ inches. Unlike the first-mentioned ichneumon, the sexes in this are much alike. However, the female has a short ovipositor that is not, however, always exserted. It also differs from it insomuch as the *Paniscus* grub is not an internal feeder, although when the caterpillar transforms into a chrysalis it becomes enclosed therein, though covered subsequently by its own special cocoon. It also has a comparatively slow flight, and does not dash hither and thither when on the wing, and in alighting it seems to do so with some hesitation. In attacking a caterpillar it fastens its dark-coloured eggs on the surface near the head. These eggs are pedunculated or stalked, and are attached by these stalks being inserted through and beneath the skin of the victim, this being in the first instance punctured by the parent ichneumon for the purpose. In feeding, the ichneumon grub does not wholly leave the egg-shell whence it has emanated, and ultimately this remains fixed to it at one end.

Only a single ichneumon grub appears to mature in each chrysalis. These brown ichneumons were of very common occurrence amongst the *Leucania* caterpillars met with on the Darling Downs and elsewhere.

Brullé (Lepelletier de Saint Fargeau's "*Histoiré naturelle des Insectes Hymenopteres,*" IV., p. 156) described in 1846, an Australian species of *Paniscus,* but it does not appear that the present insect is identical with the one noticed by him. The following technical description will serve to distinguish the latter:—

Female.—Yellowish brown, spot on vertex including ocelli, scabbard of ovipositor and claws of feet black; posterior orbital band yellowish; legs passing outwardly to pale testaceous; finely punctured and for the most part clothed with appressed pale-coloured pubescence, a few stronger hairs on fore-border of clypeus. *Head,* depression containing antennary fossæ not divided. *Thorax,* scutellum with disc bounded by straight posteriorly approaching keels; metathorax transversely wrinkled, without distinct surface areas, fore-border roundly excavated, the excavation being bounded by a ridge. *Abdomen,* 1st joint with spiracles long before middle; ovipositor comparatively well developed, measuring when exserted nearly as long as first body segment; hairy divisions of scabbard curved upwards at origin. *Wings* with dark-brown veins and brownish-yellow stigma, areola present, 2nd recurrent (discoido-cubital transverse) continuous with outer cubital transverse, veins interrupted by—usually oval—clear glabrous spaces having the following disposition, one in the middle of 1st abscissa (present) of cubital, one in the outer cubital transverse, two in the 2nd recurrent (discoido-cubital), and one in the discoidal—between origin of sub-discoidal and posterior margin. *Claws* with comb-like teeth—as in other Ophionoidæ. Total length, 20 mm.; expanse wings, 17 mm.; hind legs, 20 mm.

Male.—Smaller, with abdomen more slender, and less wide at extremity. The face is either yellow, or much paler coloured than remainder of body; last abdominal segment represented by two oblong valves instead of a single sheathing scale.

4. *Apanteles ruficrus,* Haliday. [Braconidæ.] (Plate 77, Figs. 5, 5*a-b.*) This is a minute insect, measuring about 1¼ lines long, with a wing expansion of 2½ lines. It is black in colour, with pale yellowish brown legs (the first joint of the hindmost pair being black), and four clear wings. It is best known from its cocoons, that are small, white, oblong bodies measuring each about 2¼ lines in length. They occur side by side, fastened together, by the loose silk that surrounds each, in masses of 50 or 60 together, and are commonly met with attached to the stalks of grain where caterpillars occur. Those whose observations have brought them to light have, however, invariably regarded them as "caterpillar's eggs" meet for destruction. The female insect may, moreover, by close attention, be detected moving at the base of the herbage that is being devoured in quest of its prey, often running for this purpose over the ground. Having found a caterpillar, the *Apanteles* probes it with its ovipositor, and so inserts into its tissue its own tiny eggs by the score. The resulting larvæ feed upon the "juices" of their victim, and so gradually effect its destruction. This is accomplished, however, before the chrysalis stage is reached. The approach of death is heralded by a general torpidity and sluggishness in the movement of the caterpillar, which may, however, crawl aimlessly to exposed situations. But, meanwhile, the young of the parasite which infest it, after raising minute rounded swellings upon its surface opposite where they individually occur, pierce its skin, and immediately on issuing spin their cocoons; and when this has been accomplished, nothing but a shrivelled and darkened skin remains to represent their host.

The Queensland insect appears to be identical with *Apanteles ruficrus* of Haliday, as is seen on comparing it with the very full description of the latter given by Rev. T. A. Marshall [*vid.* Species des Hyménoptères D'Europe. Les Braconides, Vol. I., page 410 (1888)]. This insect, according to the latter authority, occurs in Europe in parasitic relation with no less than seven distinct species of caterpillar, amongst which are included two species of *Leucania—i.e.,* the genus to which our present pest belongs.

This parasite is generally very efficacious in destroying the *Leucania* during the caterpillar phase of its existence. It is, however, itself in turn often preyed upon by a still smaller hymenopteron. This is a bronzy-black insect, measuring about 1 line in length, and is a chalcid-id fly apparently belonging to the genus *Dibrachys*. The *Dibrachys* however, does not appear to attack it until it has accomplished, for a season, its useful work. It may, nevertheless, occur in such numbers as to render the *Apanteles* locally scarce for some considerable time. In the ordinary course of events, each little cocoon in the mass opens at the top by a little cap-like lid as if it had been cut across at this spot, and so the primary parasite emerges. But when the *Dibrachys* has attacked it, the end remains closed, and a small round opening eventually occurs in its wall.

5. *Linnæmyia migripalpus*, n. s. [Fam. Tachinidæ.] (Plate 77, Fig. 6.) This insect, that resembles in general appearance a Meat Fly (*Sarcophaga*), or large house-fly, is very serviceable in preventing the transformations of the caterpillars to egg-laying moths. Where its victims occur, it may frequently be observed slowly wending its way amongst the wheat stalks and constantly settling thereon. It measures, as a rule, about $\frac{5}{12}$ inch in length, and is of a greyish colour, has an ashy white face, a dark-striped thorax, more or less pale brown upon the hind body, and brownish-yellow legs with black feet. It is, moreover, clothed with numerous stout black bristles and stiff hairs. Its habit is to glue one or more of its numerous eggs to the surface of the body of the caterpillar it attacks. These, on hatching, produce tiny maggots that bore their way into the tissue of their host, and feed thereon until fully developed; and then, without fabricating any special covering, they transform into pupæ within their own hardened, discoloured skins, becoming smooth, dar-brown or nearly black, cylindrical, objects with rounded ends.

The caterpillar has meanwhile entered the soil and become a chrysalis, though it would appear that sometimes the victim is not able to reach this degree of development. In the latter event the pupæ of the parasite are exposed in the soil instead of remaining within the protecting covering otherwise available.

The period that elapses between the attachment of the egg of the Tachinid parasite to the caterpillar and the appearance of the fly is about three weeks; but this is subject to variation as the result of special climatic and other conditions.

The percentage of caterpillars victimised by this fly, in any of the occurrences of this grass-marauder that have been observed in Queensland, has not been estimated. There are, however, grounds for concluding that in some instances it is very large.*

The following description will serve to identify this parasite:—

Linnæmyia nigripalpus, sp. nov.—*Head* with frontal vitta wax-yellow coloured; face, cheeks greyish white; 2nd joint of antennæ grey above; "beard" white. Head narrower at level of vibrissæ than at origin of antennæ. Two stout macrochetæ on vertex behind ocelli, orbital bristles present; three smaller bristles above vibrissæ,

* Related Tachinid parasites of *Leucania unipuncta* have been met with in other countries. Thus F. M. Van Der Wulp has described, as occurring in British India, a Tachinid parasite of *Leucania extranea*, Guen. (synonymous with the *Leucania* under notice), with the designation *Masicera castanea* (Indian Museum Notes, III., page 12, 1894), from which the present insect differs by marked structural features —the minute palpi and hairy eyes, amongst others, D. W. Coquillet has also recorded three related parasites as victimising *Leucania unipuncta*, Haw., in North America:— *Belvosia unifasciata*, Dsv.; *Phorocera leucaniæ*, Coq.; and *Winthemia 4-pustulata*, Falv. (Tech. Ser. 7, Div. Ent. U.S. Dep. Ag.)

which latter are situated above level of the oval margin; sides of face bare. Antennæ fuscous, 2nd joint rather less than ½ third, 3rd joint compressed, extremity truncated and widened, upper edge concave; arista thickened gradually, tapering to a point, basal joints well developed. Eyes with pale hairs. Proboscis black at base, suctorial portion brown. Palpi minute black, with a terminal long black hair. *Thorax* grey with four dorsal longitudinal narrow black bands, not extending to scutellum, with three post sutural macrochetæ (above base of wing) and three sternopleural ones; scutellum with four pairs of marginal macrochetæ, central ones smaller. *Abdomen* elongate, testaceous-brown; the centre of the back occupied by a broad black band that widens generally posteriorly (so as to occupy greater part of width of 4th), and, moreover, expands towards the posterior border of each segment; venter with a central black spot on each, and an additional lateral one on each side of the 4th and 5th segments; 2nd abdominal segment with two and 3rd segment with six macrochetæ on posterior border; those on 4th nearly hidden by long bristles. *Legs* testaceous-yellow, rounded spot at base, and elongated spot at extremity, and tarsi black; pulvillus of foot white. *Wings* with 1st longitudinal vein bare, 4th longitudinal reaching fore-border rather less than half-way from tip of 2nd to apex; small cross vein opposite middle of discal cell. *Tegulæ* white. Length, 12 mm.

B.—Predaceous Insects.

In addition to the true parasites of the *Leucania* caterpillars, there are other insects belonging to Beetle (*Coleoptera*), Bug (*Hemiptera*), and other families that prey upon them, and either suck out the fluid contents of their bodies or consume their tissues.

Amongst these the most conspicuous, although not the most prevalent, is a large beetle belonging to the family Carabidæ, and named *Calosoma australis*, Hope. This beetle may attain a length of an inch, and maximum breadth of half-an-inch. It is nearly black beneath, but its upper surface is of a brilliant dark-green colour, and its wing-covers are striated with numerous punctured lines. These features, as well as its general form, are represented in Fig. 1 of Plate 77.

The *Calosoma* beetle runs over the surface of the ground in quest of its prey, but its secluded habits and activity, as well as the fact of its being for the most part nocturnal, prevent its being observed as frequently as might otherwise happen. It is, however, a voracious feeder, seizing its victim in the first instance in its formidable jaws, and no doubt renders considerable service.

C.—Birds.

Allusion has already been made to the service performed by birds in limiting the numbers in which these caterpillars occur. When a visitation of caterpillar hordes is being experienced, native birds, as a rule, are not numerically sufficiently strong to accomplish very noticeable benefit. It is, however, during seasons in which these marauders do not assert their destructive capabilities that the useful work of these friends of the farmer is performed. At these times they largely contribute to maintain the numbers in which these insects occur within safe limits. Amongst them may be specially mentioned, not only such birds as Laughing Jackasses (*Dacelo gigas*), the Pied Crow Shrike (*Strepera graculina*), the Magpie (*Gymnorhina tibicen*), Butcher Birds (*Cracticus spp.*), Magpie Larks (*Grallina picata*), the Mutton Bird (*Corcorax melanorhamphus*), the Crow (*Corvus australis*), the Curlew (*Œdicnemus grallarius*), the Plover (*Lobivanellus lobabus*), but also the smaller Fly Catchers proper, not excepting even the diminutive Blue and Red-backed "Wrens" (*Malurus spp.*). There are, however, some birds that accomplish even greater work than these, and reduce the numbers of the caterpillars to a very appreciable extent when they occur in the myriads that are sometimes encountered. The Straw-necked and White Ibises are especially alluded to in this connection. These not only feed over

PLATE 75.—WHEAT: HEAD OF STOOL SHOWING INJURY BY CATERPILLAR.

the grass lands in flocks of thousands, but visit the cultivated lands, should the crops be not too high, in immense numbers also. And when the caterpillars have gone into the soil to pupate, they will even search for them with success with their long beaks, probing the earth in all directions.

D.—Disease.

The consideration of the subject of disease in caterpillars—caused by either bacteria or by fungus germs, and its possible propagation by artificial means—is postponed.

REMEDIES.

1. The effectual exhibition of remedial measures implies a prompt recognition of the presence of the caterpillars. As a rule they may be long present in a growing crop and yet escape observation, simply because their injuries are not sufficiently pronounced to betray their occurrence. It is, therefore, expedient that the farmer inspect from time to time his growing crop, especially early in August and February, and pull up here and there some of the ranker growing clumps or stools, and shake these well with a view to discovering the immature caterpillars—pale miniatures of the pest as ordinarily perceived. This remark is prompted by the experience, that usually it is not until the caterpillar is full-grown and has almost completed, not only the first phase of its existence, but also all the injury that it is capable of inflicting, that measures of repression are sought out.

2. Moreover, as it often happens (though the reverse may occur) that the whole area of a plot in crop is not simultaneously attacked, but different parts are visited successively, it will be found generally practicable to isolate the earlier infested portions, if narrow roads be left intersecting the area under cultivation, to contain ditches or furrows that may be ploughed or dug along them.

3. Although generally it is expedient to sow early and raise a quickly maturing crop in view of the probability that rust may assert its presence, it is expedient, having regard to the probable occurrence of caterpillars, to so arrange the time for sowing that the plants constituting the crop will not be sufficiently advanced at the time that the moths are about to afford a suitable location for their eggs. And in deciding the probability of such an occurrence it is necessary to note two things:—1st, the extent to which the caterpillars and chrysalises constituting the immediately previous infestation have been victimised by parasites; and 2nd, the degree of prevalence of the parent moths. The former may be generally inferred by the comparative numbers in which moths visit the lights in the house after nightfall; and the latter by submitting uninjured chrysalises, in earth, to the Department for examination. It must be added, however, that, though June is probably the best month to sow on the Darling Downs some cereals (*e.g.*, oats), still, owing to the dryness that generally prevails then, germination may not take place.

4. When caterpillars are early perceived in the young growth it will be often expedient to feed it off with sheep or cattle. The trampling of stock is very fatal to pests of this description, and the act of feeding on the part of cattle also destroys them, even where they are not killed by exposure and by partial deprivation of sustenance.

A similar result may be accomplished by passing a heavy roller over the land, as, having soft bodies, they are quite readily injured; but this procedure, as also the preceding, can only be successfully

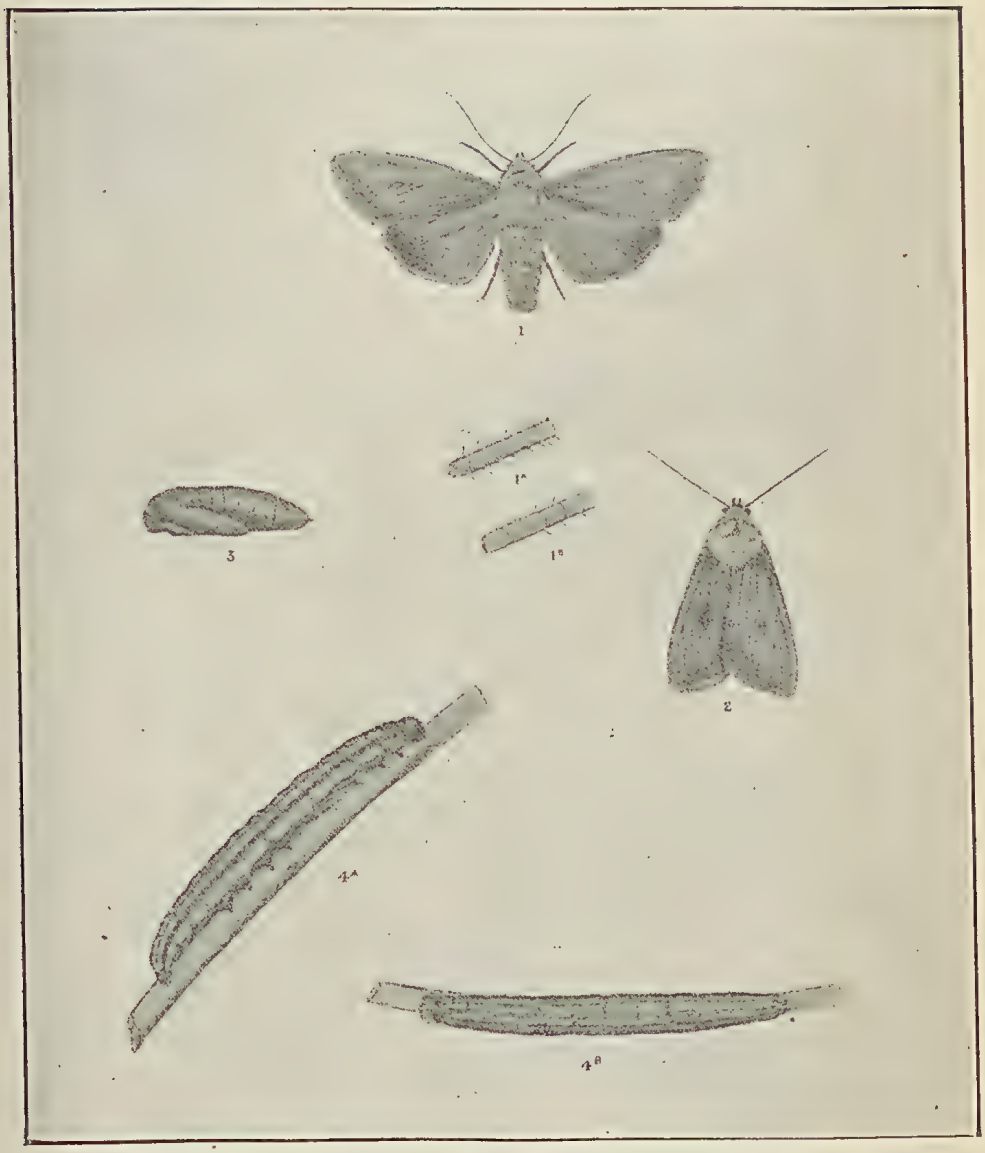

PLATE 76.—*Leucania unipuncta*, Haw.

resorted to when the growth is quite short. The use of a roller, under these circumstances, will be especially serviceable when the ground is firm and smooth. The presence of a strong stubble, in the case of a second growth of green fodder having to be dealt with, will, of course, too, interfere with its use. A roller, moreover, cannot be advantageously employed at times when it would quickly become covered with adherent soil, for this would produce results somewhat similar to what would be attained were the surface naturally uneven.

5. Poisoning caterpillars in the developing wheat or barley crop, at a time when much leaf for them to consume occurs is not advised. To be efficacious then an application to the entire foliage would be necessitated. Even were it expedient in the face of other objections, we have not at present in Queensland the appliances for treating large areas, such as are the Strawsonizer and its more modern representatives. Poisoning, however, is a valuable procedure, when already much of the flag has been consumed, and the heads of grain are advanced in growth and threatened with attack. The poison then favoured is the ordinary Cut-worm Bait. This is not a fluid but a mixture composed of an arsenic salt (such as Paris Green, Arsenate of Lead, ordinary Arsenic Arsenious Acid, or Arsenite of Soda), as the essential ingredient; bran or middlings and bran in equal amounts, as the medium, and molasses or sugar for the attractant. The two first are to be mixed in the proportion of 1 lb. to 30 lb. (even up to 50 lb.), and the mixture moistened with sugar and water in the proportion of ¼ lb. to 1 gallon (or molasses 4 lb.). It is found in our practice preferable to slightly moisten the medium before adding the poison, since owing to its density it cannot well be evenly mixed with a dry medium. The mixture, again, should be not rendered wet, but moist enough for the bran, &c., whilst cohering to run through one's fingers. This bait should be broadcasted over the surface through the crop, before nightfall when the caterpillars principally feed. Injury to standing wheat, in moving in it through and through, limits the use of this procedure in its case.*

6. In many cases, as previously suggested, fields owe their visitation of caterpillars not to the fact that the moths have earlier deposited their eggs on the plants constituting the crops growing thereon that are the object of attack, but, on the other hand, to migration of caterpillars from adjacent ones. The same remark applies also to different plots in the same field. That this has been the case has been shown in many instances, in the course of this investigation. It becomes, therefore, expedient to adopt measures to protect the still unvisited cereal or grass crops. This may be effected by the adoption of one or other of the following measures:—Surround the infested area with a ditch or furrow. If the ground be loose or rubbly in accomplishing this, plough in succession two or more furrows, as deep as practicable, with a double mouldboard plough, making the sides as loose as possible by dragging brush

* Mr. L. Redwood, Toowoomba, has laid stress on the efficacy of the Poison Bait when barley is being attacked and it has reached the stage of growth when it is turning a golden yellow, the flag is down, and the heads are about to be cut off by the caterpillars, now very hungry. He uses as a mixture:—1 bushel of wheat bran, 1 lb. arsenic, or its equivalent of Paris Green, sweetening with sugar syrup (preferable to molasses), until the taste of the poison is masked. He also advocates adding a green analine dye to the sweetening fluid when Paris Green is not used. He lays great stress on thorough mixing. He does this first when the ingredients are dry, using a shovel and mixing floor; then with further mixing, adds the sweetening with a sprayer or watering-can, until the necessary moist condition is reached. This bait should be preferably made in the morning and used late in the afternoon; the poison thoroughly impregnating it meanwhile. A bait so made and employed he has found quite deadly to the caterpillars and serving to enable a harvest to be secured that would otherwise be sacrificed.]

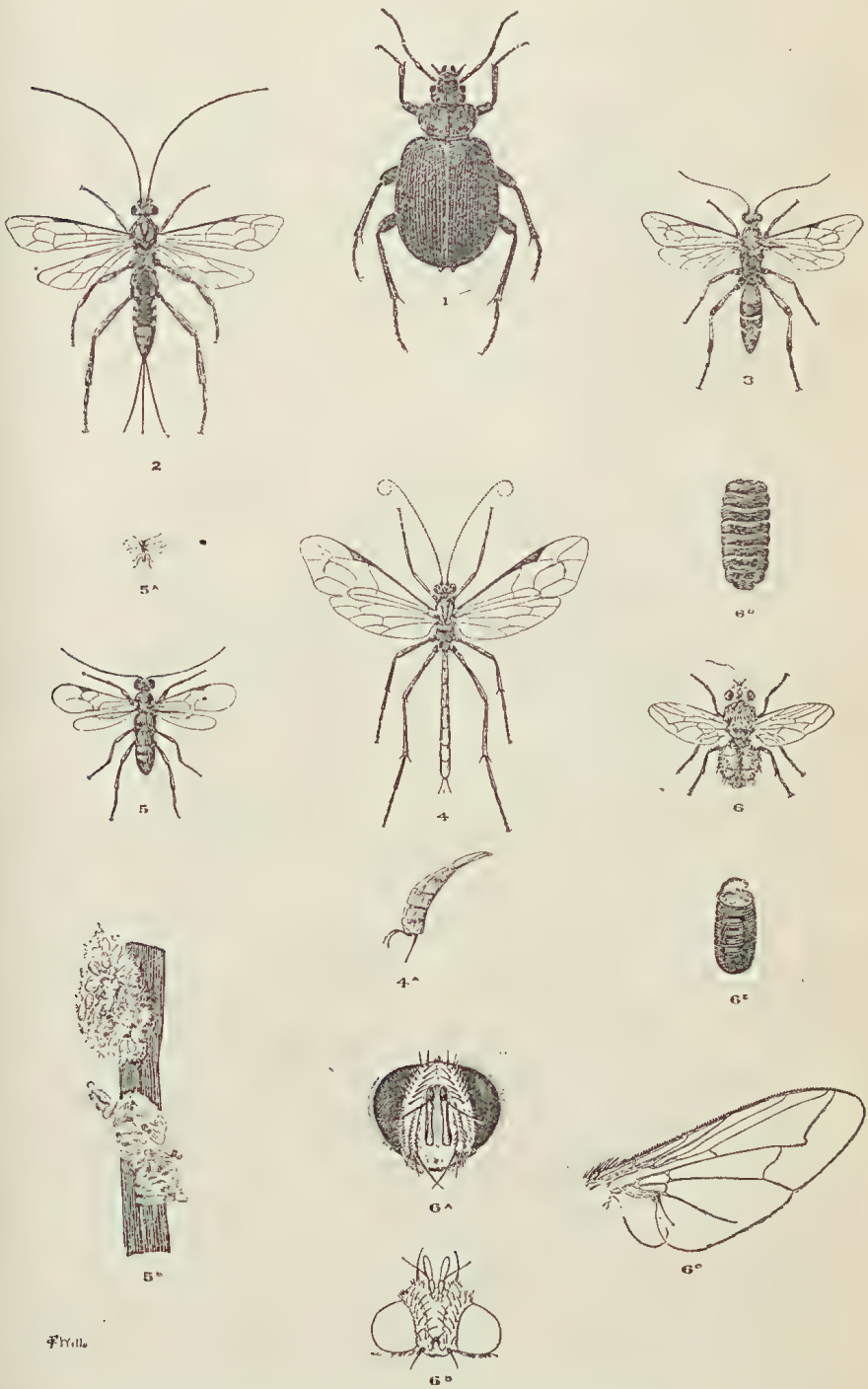

PLATE 77.—NATURAL ENEMIES OF *Leucania Unipuncta*, Haw

along it. Moreover, should coal tar or gas lime be sprinkled along one of these, a still more effectual barrier will be secured. When the soil is, on the other hand, not loose, but sufficiently firm to allow of one side of the furrow remaining perpendicular or even overhanging, a standing crop, under the circumstances alluded to, may be protected by constructing a special form of ditch such as is described in the following quotation:—"The worms [writes the late Dr. C. V. Riley] may be prevented, as a general thing, from passing from one field to another by judicious ditching. It is important, however, that the ditch should be made so that the side towards the field to be protected be dug under. About every three or four rods a deep hole in the ditch should be made, in which the worms will collect, so that they can be killed by covering them with earth and pressing it down. They may also be destroyed by burning straw over them—the fire not only killing the worms but rendering the ditch friable and more efficient in preventing their ascent" (*Report Commissioner of Agriculture*, U.S.A., 1882, page 96). The holes in the ditches alluded to trap the caterpillars as they wend their way along the bottom of the ditch in their effort to pursue their onward march to pastures new; and when in these an ordinary rammer will despatch them.

Experiments on my part have shown that the caterpillar will not eat fodder that has been moistened with a comparatively weak solution of either iron sulphate or copper sulphate (bluestone), even after such fodder has been subsequently dried off; or, if it does so—as may happen when the former of these reagents has been used—only sparingly so, and with apparent reluctance. It may, therefore, prove advantageous, by way of protecting plant growth, to spray it with one or other of these solutions. The necessity for protecting young maize plants from caterpillars travelling from an adjacent field of wheat, oats, or other cereal seems to afford an instance in which this procedure might be not only practicable but also successful. However, the possible injury to the plant from the use of too strong solutions must be anticipated.

Again, with a like object in view it will often be found profitable to poison a broad strip of herbage immediately in advance of a travelling host of caterpillars. Paris Green or London Purple may be used for this purpose. [If the former be employed, that bearing the brand of Messrs. Blundell and Spence, and sold in 1-lb. packets, is recommended in preference to other forms of the article on the market, as having a composition fairly uniform.] These poisons may be exhibited either in water or with some dry diluent as a powder. In the former case 1 lb. of Paris Green or ¾-lb. of London Purple, having been first made into a paste, should be mixed with 150 gallons of soapy water to which a like weight of fine lime has been previously added (*i.e.*, at the rate of 1 teaspoonful Paris Green to 1½ gallons water), and the whole wash be kept well stirred whilst being applied. In the latter case it may be mixed with flour, or plaster of Paris, 1 lb. of Paris Green being mixed with 40 to 50 lb. of the former, or 100 lb. of the latter. (*Note.*—Since this was written Arsenate of Lead and Arsenate of Lime have, for most insecticidal purposes, superseded Paris Green and London Purple. In employing the former use the paste in the proportion of 1 lb. to 10 gallons of water, or as a dry application mix the Arsenate of Lead powder, with wood ashes, road dust, cheap flour, or powdered lime.) These poisons, if used dry, should be dusted over the plants, having been first placed in a bag, made of some pervious material that is to be fastened to a pole (two such bags, one at each end of a pole, may be placed across a horse's back, and the animal led over the ground it is

proposed to poison, when the jerking will liberate the poisonous dust). If applied in the form of a wash, the mixture may be distributed by means of a watering cart, or Strawsonizer, or other similar apparatus. When the strip of poisoned fodder has served its purpose, it should be mowed down and burnt, to prevent its being consumed by stock prior to its being rendered innocuous by exposure to successive showers of rain.

7. The fact that the insect hibernates as a caterpillar, and frequently may exist in the egg condition in dry grass and stubble, and, moreover, habitually frequents rank herbage, suggests the expediency not only of maintaining the headlands of fields clean and free from weeds, but also of periodically firing pastures. This should be done even when visitations of caterpillars are not immediately impending, as the insect always exists in these situations in greater or less number, and will, under favouring climatic conditions, the existence of a paucity in the numbers in which its natural enemies occur, or the lessened effectiveness of natural checks, generally multiply to a highly prejudicial extent.

8. Under certain special circumstances the moth may be captured by trap-lanterns, or killed by attractive poisoned sweets. The conditions under which crops are grown in Queensland are, however, such that their use is not likely to be attended with any marked result.

9. The fact of domestic poultry being very partial to insects, and caterpillars especially, might be utilised in repressing these in ordinary seasons; the difficulty that is experienced in getting certain varieties to roam far from their roosts being overcome by the use of transportable fowl-houses, as recommended in the writer's Report on the Grub Pest of Sugar-cane: these houses to be moved over the standing crop when this is but little grown and the caterpillars are still young.

10. Farmers interested in caterpillar repression should make it their business to strenuously oppose the destruction of all insectivorous birds and their eggs; especial allusion being made to such birds as are hereafter mentioned.

Description of Plates.

Plate 75.

Head of Stool of Wheat, as injured by *Leucania* Caterpillars. From photograph by C. J. Wills.

Plate 76.

Fig. 1. *Leucania unipuncta* Moth. Natural size. 1 *a*, portion of antenna of male; 1 *b*, portion of antenna of female. (Magnified representations.)
„ 2. *Leucania unipuncta* Moth. Position of rest.
„ 3. Chrysalis.
„ 4. Caterpillar. Dorsal and lateral views.

(From Drawings by C. J. Wills.)

Plate 77.

Fig. 1. Predaceous Beetle—*Calosoma australis*, Hope.
„ 2. Red Ichneumon—*Theronia rufipes*, n. sp. Female.
„ 3. Banded Ichneumon—*Exephanes leucaniæ*, n. sp. Male.
„ 4. Tawny Ichneumon—*Paniscus* (*productus*, Brullé?). Female.
„ 5. Social Ichneumon—*Apanteles ruficrus*, Haliday (enlarged representation). 5 *a*, Natural size; 5 b, Pupa cocoons.
„ 6. Tachina Fly-parasite—*Linnæmyia nigripalpus*, n. sp. 6 *a* and 6 *b*, Face (magnified representation); 6 *c*, Wing (enlarged representation); 6 *d*, Larva (white in nature); 6*e*, Cocoon from which fly has emerged.

(From Drawings by C. J. Wills.)

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1921.	Sept., 1920.		Sept.	No. of Years' Records.	Sept., 1921	Sept., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·58	20	1·58	0·21	Nambour	2·48	25	3·71	2·57
Cairns	1·67	39	3·85	1·03	Nanango	1·96	39	1·66	2·47
Cardwell	1·45	49	3·09	2·52	Rockhampton ...	1·31	34	2·08	0·66
Cooktown	0·58	45	0·95	0·91	Woodford	2·15	34	4·32	2·48
Herberton	0·47	34	0·89	0·23					
Ingham	1·14	29	5·19	2·99					
Innisfail	3·56	40	8·80	2·49					
Mossman	1·13	13	2·37	2·04					
Townsville	0·78	50	1·76	1·89	*Darling Downs.*				
					Dalby	1·80	51	1·25	2·34
Central Coast.					Emu Vale	1·90	25	2·82	2·06
					Jimbour	1·66	33	0·63	1·65
Ayr	1·57	34	1·32	0·91	Miles	1·49	36	1·22	2·67
Bowen	0·84	50	1 07	1·07	Stanthorpe ...	2·47	48	2·77	2·99
Charters Towers ...	0·80	39	1·31	0·66	Toowoomba ...	2·24	49	3·04	2·40
Mackay	1·49	50	9·07	1·20	Warwick	1·92	34	1·84	2·29
Proserpine	2·00	18	9·44	2·93					
St. Lawrence ...	1·33	50	2·26	0·93	*Maranoa.*				
					Roma	1·61	47	0·64	2·64
South Coast.									
					State Farms, &c.				
Biggenden	1·72	22	2·22	2·61					
Bundaberg	1·84	38	0·35	1·94	Bungeworgorai ...	1·58	7	0·58	1·75
Brisbane	2·08	69	2·02	3·43	Gatton College ...	1·76	22	1·85	2·54
Childers	2·03	26	1·34	3·21	Gindie	0·90	22	4·64	1·32
Crohamhurst ...	2·53	25	5·28	3·71	Hermitage ...	1·68	15	2·28	2·51
Esk	2·35	34	1·66	3·24	Kairi	0·79	7	...	0·24
Gayndah	1·60	50	0·87	2·67	Sugar Experiment Station, Mackay	1·33	24	...	1·20
Gympie	2·16	51	3·17	2·82	Warren	0·75	7	1·40	0·40
Glasshouse M'tains	2·08	13	...	2·77					
Kilkivan	1·74	42	1·77	1·86					
Maryborough ...	1·97	50	2·49	2·52					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1920, having been compiled from telegraphic reports are subject to revision.

GEORGE E. BOND, State Meteorologist.

ARSENICAL POISONING.

By A. H. CORY, M.R.C.V.S.

The medicinal treatment for arsenical poisoning should be prompt and thorough. In small animals, such as dogs and cats, an emetic is advisable, such as salt and mustard in about 3 oz. of warm water. With horses and cattle, medicine must be given, which forms an insoluble compound with the arsenic.

The following treatment is recommended:—Take about 2 oz. of ordinary washing soda, and dissolve it in about half a pint of water, then add 2 oz. liquor ferri perchlor; a sediment forms, and it is then strained through a piece of fine linen and the sediment collected and mixed in 1 pint of cold water and given as a drench, being repeated every half-hour for at least five or six doses.

Editorial Notes.

Primary Principles of Co-operation.

In this issue the Director of Fruit Culture, Mr. A. H. Benson, discusses some problems of produce disposal for which a solution is being sought by the fruitgrowers of this State, and, incidentally, enters a strong plea for the broadening of co-operative effort by primary producers generally. The development of co-operation is evidence that the farmer is gradually readjusting his point of view to bring within focus the effects modern social and economic changes are having upon his industry, and necessity is compelling him to affiliate with his fellow farmers in order to secure fair returns for his labour and enterprise. The pinch of hard times and market problems, the futility of fighting single-handed trade combinations both on the buying and selling sides, transport difficulties, and excessive operation costs, are the main forcing factors in a general forward move towards wider and intelligent co-operation. The pressure of need is one of the primary principles of joint action. Another is combination on a broad, constructive, sound, economic basis. The first is axiomatic and, in respect to the second, experience teaches that often, in the establishment of co-operative enterprises, business principles are to some extent ignored. The rocky road of rural progress is strewn with the wrecks of associations that were conceived with high hope and started out freighted with lofty purpose and impractical enthusiasm. In any further extension of co-operative enterprise the lessons of the past should be our guide. The sound business way is the only way. No new commercial venture can expect to escape the fierce competition of existing enterprises, directed by keen brains, with which it will inevitably be beset. Brains must be met with brains, and no co-operative concern can expect a full measure of success unless based on modern business principles and economically conducted. These observations, which are almost in the nature of a warning, may be thought unnecessary. In view of a general awakening to the value of combined action by primary producers, they possibly are, for on all sides are signs of the recognition of science and experience as valuable auxiliaries in bringing about better farming, better business methods, and a richer rural life.

General Notes.

PUBLICATIONS RECEIVED.

The Veterinary News (13-8-21) has a very interesting editorial on tuberculosis in cattle and its relation to public health, in the course of which it states: "If the veterinary profession were to inform the public that tuberculosis in cattle was a great danger to human health; that a large percentage of deaths, joint diseases, meningitis, glandular enlargements, tabes mesenterica, &c., were caused by the consumption of milk of tubercular cows; that the care taken in the pasteurisation of milk was not always such that would guarantee the milk being germ-free; that cattle, found to be *tubercular by the tuberculin test were being sold and scattered all over the country (U.K.), more especially by pedigree breeders*; and that cattle and swine were of more importance than human life or health: it would be doing its duty and earning *kudos*. It is said that the country could not afford to stamp out the disease, but the best veterinary experts have informed us that this is not so. It could be stamped out much more cheaply than the costs of erection of expensive plant for the pasteurisation of milk. . . . When tuberculosis endangers the health of the community and takes a high toll of young life, it cannot afford to spend any money in attacking the disease at its root. . . . The country (U.K.) pays more attention to the prevention of diseases of the potato than it does to the prevention of tuberculosis in cattle, and, in consequence, in man. . . . There are a few ultra-selfish dairy farmers and pedigree breeders who, in order to benefit themselves, spread the disease elsewhere without diminishing its total incidence one jot. Tuberculosis should be prevented or eliminated first by eradicating the disease from cattle. That is the paramount duty of the veterinary profession. As to its suppression in man, that becomes the responsibility of the medical profession."

Answers to Correspondents.

DAIRY STOCK.

P. J. Hull (Kaiyera, Cardwell)—

(1.) Using milk for a calf from a cow of another breed will not affect the purity of the calf's breeding in any way. It is possible, however, to seriously mar the dairy quality of any calf bred for production (dairy purposes) by rearing it solely on a plentiful supply of whole milk. In other words, a calf of a dairy breed can be reared *too well*, and in this way encouraged to lay on flesh and fat. Jersey calves, for example, fed solely on an excess of whole milk up to weaning age, say seven or eight months, would have a tendency to alter in type and to become gross, particularly if run on rich pastures. Some of this grossness may be overcome later on by breeding from them younger than is usual, say at the age of fifteen months.

(2.) Quantity of whole milk required daily for a calf—One gallon constitutes an ample ration, even for a well-grown calf, a younger animal requiring slightly less. It is not known whether you purpose continuing to rear the Jersey calves on other cows, but, if the latter are fairly good milkers, one cow should rear two calves.

(3.) The practice of thoroughly quietening the calves by tying them up at night, using a strap round the neck, and a length of chain with a swivel on it, will do much to keep them quiet and tractable. This system is certainly to be preferred to allowing the calf to run at large with a foster-mother.

(4.) Your pure-bred Jersey bull may be used for all classes of healthy animals, without detriment to the purebreds.

(5.) We have no special pamphlets on the subject of the feeding of dairy cows and calves, other than the pamphlet on feeding whey, which is being forwarded to you. This is merely sent for reference purposes, as it is known you are not cheesemaking.

(6.) Details of certain rations for dairy cows are being forwarded. These may not be exactly applicable to your case, but will serve as a guide as to the quantities of respective foods required when an animal has to depend solely on foods supplied.

ENTERITIS—A POULTRY DISEASE.

H.L. (Reid's Creek, Gayndah)—The Poultry Expert, Mr. J. Beard, advises as follows:—

"Now that the hot weather is again with us it would be wise for all poultry-keepers to be on the alert and avoid, if possible, the introduction of this serious disease. *Causes.*—Stimulating foods, over-feeding, irritating vegetable and mineral poisons, drastic purgatives, unclean water, the presence of unslacked lime, continuous feeding of house scraps or sloppy foods which have a tendency to become sour and contaminated. The disease, when due to any or several of the foregoing causes, is generally confined to individual birds, but if it becomes contagious it spreads rapidly through the flock. Heavy mortality is a consequence. *Symptoms.*—Listlessness, closure of eyes, ruffled plumage, continual trembling, restlessness, shanks lose lustre and shrivel, bilious-looking excreta. *Treatment.*—Quarantine affected birds in a clean warm coop, administer two teaspoonfuls of castor oil to each; two hours later give to each ten drops of chlorodyne on a piece of bread. Should the excreta not harden in from six to eight hours, give another five drops of chlorodyne in the same way, and continue until a cure is effected. Feed on soft food such as bread and milk or boiled rice. Treatment should be commenced as soon as symptoms are noticed. Houses and runs must be thoroughly cleaned and disinfected. All rubbish and dirt should be burnt. Remove droppings every day and burn them, as they contain germs of the disease. *Prevention.*—Cut a kerosene tin in half, end up, place therein clean drinking water to which has been added one tablespoonful of kerosene. The oil spreads over the surface, and the birds get a little every time they drink. This practice should be carried out every third day during a threatened attack. All other water should be kept out of reach. This is also a certain cure in case of slight colds or roup of any kind, providing the gills and nostrils are washed out and dried."

Farm and Garden Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasselling period harmonising later on with the summer rains, December planting may be carried out in districts were early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resistant. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum when in head, in the proportion of one-third of the former to two-thirds of the latter, a well balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary, otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton sown in October and November will be making great headway, owing to the September and October rains. Keep down all weed growth by scarifying as long as the growth will admit of horse work. Tree cottons, such as Sea Island and Caravonica, should be topped and pruned.

Kitchen Garden.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown. All vacant ground should be well manured and dug two spits deep. Manure and dig as the crops come off, and the land will be ready for use after the first shower.

FLOWER GARDEN.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface, beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulaca, zinnia and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

Orchard Notes for December.

THE COAST DISTRICTS.

The planting of pineapples and bananas can be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple-growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borers should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as

possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codling moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste. It is better to get a good price for half the crop and destroy the balance than to rush the whole on to the market and get little or nothing for it.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codling moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gall. of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain take place. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

CAPE WEED.

Lackey and Sons (Summit)—Your letter and the specimen forwarded were referred to the Government Botanist, Mr. C. T. White, who advises as follows:—

> "The specimen forwarded is the Cape Weed (*Cryptostemma Calendulacea*), a native of South Africa and a naturalised weed in practically all the Australian States. It is much more abundant in New South Wales and Victoria than in Queensland, and in those States is regarded as a most aggressive and noxious weed. It has, however, a certain food value for stock, though when it dies down it presents a somewhat woolly mass, and may cause impaction in animals feeding on it."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6·28
3	6·1	5·31	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5 26	5·49	4·56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6·9	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6·13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4 47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5·40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5·11	5·56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6 22	4·51	6·42
24	5·37	5·44	5·5	6·0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5 35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6 3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6 4	4·46	6·27	4·56	6·45
31	...	...	4·59	6 5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queenslan New South Wales, and Victoria, where th clock time is identical).

			H. M.
2 Sept.	●	New Moon	1 33 p.m.
9 „	☾	First Quarter	1 30 p.m.
17 „	○	Full Moon	5 20 p.m.
25 „	☽	Last Quarter	7 18 a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·18 p.m.

1 Oct.	●	New Moon	10 26 p.m.
9 „	☾	First Quarter	6 12 a.m.
17 „	○	Full Moon	9 0 a.m.
24 „	☽	Last Quarter	2 32 p.m.
31 „	●	New Moon	9 39 a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8 Nov.	☾	First Quarter	1 54 a.m.
15 „	○	Full Moon	11 39 p.m.
22 „	☽	Last Quarter	9 41 p.m.
29 „	●	New Moon	11 26 p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7 Dec.	☾	First Quarter	11 20 p.m.
15 „	○	Full Moon	12 50 p.m.
22 „	☽	Last Quarter	5 54 a.m.
29 „	●	New Moon	3 39 p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SEEDS AND WEEDS.

BY F. F. COLEMAN, Expert under the Pure Seeds Acts.

"In general, those weeds are most numerous which rise from seeds, and those most difficult to be extirpated which come from roots."—Thomas Hale, "The Compleat Body of Husbandry, 1756."

A seed may be described as a ripe ovule containing an embryo plant. The embryo is the essential part of the seed; the other structures are subsidiary to its nurture, protection, and germination.

Seeds are usually able to remain for months, or even years, in a dormant state, hardly distinguishable from death, except in their power of reawakening.

They may not be ripe on separation from the parent plant, and ripeness is not always coincident with readiness to germinate. In cereals it will be frequently noticed that during a wet harvest some grain germinates in the seed head; others may undergo a form of incipient germination which prevents or retards subsequent growth. Generally speaking, seeds are not ready to germinate until they have passed through a stage of apparent dormancy, during which period the enzymes or unorganised ferments contained in the seeds have time to do their work by preparing the reserve food material.

If Mauritius beans or Lucerne seed be dropped into water, and left to soak for a few hours, it will be noticed that some of them remain the same size and shape as when put in water. These are called "hard seeds," their seed coats being so impervious to water as to delay germination. It has often been stated that the thickness of the hard layer of the testa prevents the seed absorbing water; this, however, may be due to the amount of ash ingredients that the coat contains.

Seeds vary greatly in their powers of retaining life, some of the Leguminosæ, in particular those containing a large amount of hard seeds, are capable of germinating after several decades. Unfortunately, carelessly made experiments have given rise to many exaggerated statements as to the powers of vitality that seeds possess.

Subtropical and tropical climates are usually associated with high temperatures and excessive moisture, which gives rise to conditions causing rapid deterioration.

The principal factor covering the keeping of seeds in good condition is a low moisture content, and storage at a non-varying low temperature.

No matter under what conditions a crop may be grown, the resulting seed will contain impurities. If reasonable care has been given to the crop, up-to-date seed-cleaning machinery will easily remove any foreign ingredients that the seed may contain. The best of machinery, however, cannot make dead and non-germinable seeds grow, but the differences in the specific gravity enable many immature and light seeds to be taken out; at the same time, the sieves will separate the foreign seeds, be they weed seeds or seeds of a cultivated plant other than the kind that the crop represents.

Seed-cleaning machinery cannot make bad seeds good, but it does make good seeds better.

Given favourable conditions at the time of sowing, the farmer may find that his crop contains a considerable number of plants other than the kind that he wishes to grow, or he may find his seed has failed to make a stand, and his season and labour have been wasted. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the purity and germination of any seed that he has purchased before sowing it.

The best is the cheapest, whatever the price, and quality should be the one and only consideration. In order to form an opinion as to the quality of any seed, careful examination should be made of a sample drawn from the actual bulk. The purchaser should ascertain the maximum amount of—

(1) Dead and non-germinable seeds.

(2) Inert matter.

(3) Weed or other foreign seeds.

If the seller has a full knowledge of the article that he is offering, he can at once furnish this information, which can only be based on an examination of a large sample drawn from the bulk in his actual possession. In the same manner the buyer can only obtain accurate information as to the quality of the seed that he has purchased by the examination of a large sample, taken from the seed delivered and now in his possession. No reliance should be placed on the appearance of any sample drawn in any other way.

Unfortunately, the majority of both buyers and sellers cannot identify even the weed seeds of most common occurrence. These vary so much in size that a statement of the percentage present conveys no real idea of the number in one pound. One per cent. by weight means that the farmer sows with every pound of seed one-hundredth of a pound of weed seeds. Darnel and Oriental rocket are frequent impurities in Oats, and the approximate number of seeds contained in 1 per cent. would be 390 seeds of Darnel (*Lolium temulentum*), and 17,900 seeds of Oriental rocket (*Sisymbrium orientale*). Many samples of Oats contain 2 per cent. of Darnel; this means the sowing of 780,000 Darnel seeds with every 100 lb. of Oats.

Seeds constitute the most variable material that the farmer purchases, and weight for weight the most costly of his purchases. As the success or failure of a crop, or even succeeding crops, may be determined by the kind or condition of the seed sown, the importance of accurate knowledge of the article is essential.

An opinion as to the quality or condition of any seed should only be based on actual facts, revealed by an analysis conducted under uniform scientific conditions. This work is undertaken by the Pure Seeds and Stock Foods Branch of the Department of Agriculture. A leaflet giving information as to size of samples and other particulars can be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

BY H. I. JENSEN, D.Sc. (SYD.).

(Continued from November "Journal.")

An area of country containing representatives of all the same soil types as the stretch between Roma and Injune was investigated by the writer in the north-east of the Pilliga Scrub, in New South Wales. A comparison of the soil analyses was

made for that area, which will, no doubt, be found to hold also in the area under review. It is given below:—

Characteristic Timber.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
Pine	0·50	2·23	·025	·049	·046	·076
Stringybark	0·71	2·81	·031	·060	·034	·062
Narrow-leaf Ironbark ..	0·65	2·12	·033	·089	·040	·064
Box Buddah (Sandalwood)	2·25	4·98	·089	·257	·129	·111
Poplar Box	2·40	5·54	·081	·281	·115	·152
Silverleaf	2·21	6·71	·098	·316	·125	·228
Belah-Brigalow Gilgai ..	5·39	6·42	·070	·568	·194	·118

The first three—pine, stringybark, and narrow-leaf ironbark (*E. siderophloia*)—are characteristic of the silicious sandstone belts and indicate typically poor soils. The others are fair to rich soils and occur on shales and calcareous sandstones.

The heavy blacksoil plain, brigalow country, and brigalow-belar country occur on the cretaceous rocks north of Roma and Mitchell, and also in strips or belts in the Walloon series along the Injune line north of Minka, and along the Durham Downs road. In the Walloon series there are narrow brigalow belts in the Upper Walloon, as near Yingerbay, a large belt in the Middle Walloon, north of Orallo, and a very much greater belt in the Lower Walloon, along the Injune Valley, Myall Downs, and Durham Downs.

Excellent belah belts are met with between Orallo and the Dividing Range, and also along Injune Creek in the soldiers' settlement area.

The sandstones represented are mostly of the calcareous variety, yielding good soils. Poor soils are confined to a few narrow strips of pine country—one situated in the top of the Walloon, near the cretaceous border, another near Orallo, and some rough sandstone mountains at the head of Injune Creek.

So closely do the timbers and soils correspond with geological formations, that if a detail geological map could be prepared showing not only the main divisions of the Walloon series, but also the horizons, that map would be at the same time a geological map, a soil map, and a forestry map.

Having treated fairly lengthily of the soils between Roma and Injune, we can now discuss the soils of the other regions more cursorily, the principles having been explained.

THE MARANOA VALLEY.

Travelling up the Maranoa Valley from Mitchell, we meet with the same formations as between Roma and Injune, but there are two other formations well represented. One of these is the cretaceo-tertiary desert sandstone. This is, in the Mitchell region, a very silicious sandstone, and has very poor sandy soils, often coarse sand, with a barren country vegetation, including lancewood scrubs (*Acacia doratoxylon*), and open forest with yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus termifolius*), woolly oak (*Casuarina inophloia*), rusty gum or sugar gum (*Angophora lanceolata*), Moreton Bay ash (*Eucalyptus tesselaris*), crooked gum (*E. dealbata*), pine (*Callitris glauca*), also the other poor country timbers already mentioned, and spinifex grass. This is pretty useless country, and is greatly in evidence about 15 miles north of Mitchell, as well as near Mitchell and Amby.

North of this, at Donnybrook and Forest Vale, we meet with good soils mostly, as between Roma and Injune, on Donnybrook and Forest Vale, giving brigalow, belah, sandalwood, box, and ironbark belts, with the same characters as those already described. North of Forest Vale and north-east at Toolumbilla and Womblebank we have the lower or calcareous Walloon belt with brigalow and belah scrubs. A beautiful belah scrub extends over a great area between Timor and Merivale, in the Dividing Range, corresponding with the belah scrubs on Injune Creek (the 56-mile) and Durham Downs.

Along the river itself are great apple-tree flats (*Angophora intermedia*), with beautiful rich sandy loams which could be made very productive by irrigation.

North of the Walloon area we get the Bundamba sandstones, which extend over most of Merivale, Crystal Brook, Eddystone Vale, Mount Moffatt, and Warrong. The soils are poor and sandy. The better flats are typical box (*E. populifolia*) country, but the rougher sandstone hills and ranges form pine country, Moreton Bay ash, sugar-gum country, and some silverleaf country answering to the description of country which these timbers have been shown to cling to.

It is fair grazing country as long as the cattle have plenty of room to "poke about," but would be very wretched if divided into small areas. It might, with

transport facilities, develop into very fair fruit and vineyard country, especially where the sandstones are felspathic, but it is, generally speaking, unsuited for farming. This poor belt is, approximately, 30 miles wide.

North of the Bundamba sandstone in the Main Dividing Range we get fairly large areas of fine basalt country on the northern portions of Mount Moffatt, Warrong, and Marlong Stations. This is first-class country, and would be as suited for cultivation as it is for grazing. Rich chocolate soils, merging into black on the flats, characterise the basalt. Coolibah, gumtop-box, and silverleaf ironbark are the main timbers. The basalt alluvials would make fine lucerne-growing areas, and the higher grounds would grow cherries and other fruits. The climate both of the Bundamba sandstone and basalt belts is that of high tableland country. The elevation is from 2,000 to 3,000 ft. above sea-level, and Stanthorpe fruits should thrive. The rainfall is much in excess of that of the plains country.

THE HEAD WATERS OF THE WARREGO.

From Killarney to Babbiloora, through the Boggarella district, we have formations, soils, and forest flora similar to those of the Walloon belts in the Orallo to Injune Creek districts, but the climate is more typical of the interior. From Babbiloora to Carnarvon Station we have the Bundamba sandstones, with their characteristic vegetation and sandy soils, already described in dealing with the Maranoa, and in the range at Carnarvon Station we have basalt country similar to that referred to in dealing with Marlong and Mount Moffatt.

The basaltic plains country at the head of the Warrego (Channing and Dooloogerah Creeks) is some of the most beautiful country in the State, and with railway facilities would be equally suitable for dairying and general farming. Its greatest defect is a remediable one—viz., the abundance of the beautiful, yet very harmful, tree zamia (*Macrozamia Moorei*). The prickly-pear has not yet reached this fine country, but is advancing in this direction, and will soon get a footing, unless checked.

THE TRIBUTARIES OF THE NOGOA.

The writer traversed down Buckland Creek to Nardoo and then across to the Nogoa at Nandowrie Peak, along the Nogoa to Vandyke Creek, up Vandyke, Coonah, and Freitag Creeks, and through the Springsure district.

Many geological formations exist in this region; hence the soils are varied. The run-off of the rainfall is very rapid, the country falling from 3,000 ft. above sea-level to 600 or 700 ft. above sea-level in from 10 to 30 miles. The streams are veritable canyons at the head, with high barren sandstone and basalt escarpments on either side.

Naturally, swift running streams deposit a great bulk of their sediments when the grade of the stream becomes less, hence the lower reaches of these streams are flanked by rather wide belts of alluvial, which, containing detritus from limestone, basalt, sandstone, shale, and other rocks, are exceedingly well-balanced and fertile soils.

In other respects the Nogoa tributaries are characterised by the same soils and vegetation that are usually found on the same classes of rocks in other parts already described, and only brief notes are essential. High up in the mountains we have basalt ranges and tablelands. The soils derived from the basalts are good; but the ranges are rough, the run-off of rainfall is rapid, and springs are very few. However, at the base of the basalt ranges springs are particularly abundant and of a permanent nature. The basalt country is mostly too rough and dry for agriculture, and too rough for grazing. The access to the tablelands is so steep that cattle seldom wander up, in spite of the rich carpets of mountain grass growing on them. The pastoralists are not anxious, either, to have their cattle in this region, since the zamia grows so thickly on the basalt ranges that most of the cattle feeding here get the rickets. The timbers on the basalts are mostly box (*E. hemiphloia*) and silverleaf ironbark (*E. melanophloia*).

Below the basalts we have the "Upper Bowen" sandstones. They occupy a belt of country bounding the Carnarvon Range basalts on the north. The soil is poor silicious sandy loam, which is very inferior pastoral country, except where basaltic detritus is intermixed through alluviation. The timbers in this region comprise spotted gum (*E. maculata*), crooked gum (*E. dealbata*), Moreton Bay ash (*E. tesselaris*), sugar gum (*Angophora lanceolata*), ironbark (*E. decorticans*), pine (*Callitris glauca*), yellow bloodwood (*E. trachyphloia*), budgeroo (*Lysicarpus*), stringybark (*E. acmenioides*), oak (*Casuarina inophloia*), dogwood (*Jacksonia scoparia*), cherry (*Exocarpus cupressiformis*), with a variety of wattles, among which *Acacia Bancrofti, A. doratoxylon, A. Cunninghamii* are very plentiful. The next belt met with to the north is the coal measures and limestones of the "Upper Bowen" formation. The soils of these coal measures are variable, inasmuch as we have strata of silicious rock and shale alternating with calcareous sandstone and shale, but on the

average this belt is good pastoral and agricultural country. The heavier calcareous belts of soil have typical calciphile vegetation—namely, brigalow scrubs with belar, wilga, and other calciphile trees. Some of the limestones of the "Upper Bowen" formation are covered with blacksoil plains devoid of timber, open plain type. These are richly clad with nardoo, saltbush herbage, and fine fodder grasses. Plains of this kind are seen at Nardoo Station, east of Mount Sunday, in the Blue Hills region, on Vandyke Creek and Spring Creek, near Mount Stereulius, on Wealwandangie Head Station, and elsewhere. With irrigation these black soils grow magnificent vegetables, as was instanced by the station garden at Wealwandangie. The Bowen limestones and calcareous shale soils contain much free "copi" (gypsum) which is the best neutraliser of excess of alkali. Hence the alkali trouble which is so great on irrigated lime soils in our western interior is not felt here; the rainfall and removal of alkali by leaching are also greater. The "Upper Bowen" coal measure and limestone belt in this area is consequently a fine belt of agricultural land, probably second to none in Queensland. The "Middle Bowen" formations, which form the next belt to the north, are composed mainly of sandstone and conglomeratic sandstone, with a coal measure belt intercalated. The coal measure portion is fair land, but contains little pure limestones. It is not noted for open plains or brigalow scrubs, but the coal measures have abundant bloodwood (*E. terminalis*), silverleaf ironbark (*E. melanophloia*), box (*E. populifolia*), and timbers like those of the Walloon coal measures north of Roma. The soils are good in all mineral plant food constituents.

Now, the conglomeratic sandstones of the "Middle Bowen" formation in this area and in other areas to be mentioned later are very much better in soil and stock feed than the sandstones of the Bundamba and Upper Bowen formations. There is much detritus derived from granite, slate, porphyry, and even of limestone in the sandstones of this belt. The soils, though mechanically gravelly sandstone soils, are richer in plant food than most other soils derived from similar massive sandstones. This belt is, therefore, fairly well suited for small stations and large grazing farms. The timbers of this belt include, conspicuously, spotted gum (*E. maculata*), yellow jacket (*E. Watsoniana*), pine (*Callitris robusta*), river red gum (*E. rostrata*), Moreton Bay ash (*E. tesselaris*), cabbage gum (*E. papuana*), and bloodwood (*E. terminalis*). The alluvial soils throughout the Nogoa quadrant are splendid. The characteristic timber is coolibah (*E. microtheca*).

THE TRIBUTARIES OF THE BROWN RIVER.

It suffices to state that the soils met with and the timbers they support are identical with those of the Nogoa, except that, in regard to timbers, several timbers of a coastal type creep in and mingle with the western timbers on the Brown River basin. That mingling of inland and coastal floras, which is first well marked in the vicinity of Rolleston, becomes very strongly marked in the country between the Expedition Range and Taroom. At the head of the tributaries of the Brown River we also meet with the calcareous shales of the "Ipswich" coal measures, with beautiful black and chocolate soils of a heavy nature, clad with brigalow, belah, wilga scrub, and the Ipswich formation sandstone, a yellow sandstone, rich in felspathic detritus, hence good in potash, on which we have open forest with box species (*E. populifolia, E. cambageana, E. hemiphloia*), ironbark (*E. melanophloia* and *E. crebra*), zamia, &c. The belar and brigalow scrubs on the black soils of Ipswich formation in this area are the specially favoured habitat of the prickly-pear, all varieties.

The coal measure belt of the "Upper Bowen" in the Brown River basin occupies comparatively low ground—usually only 600 to 800 ft. above sea-level; hence much of it is alluviated with wide stretches of magnificent alluvial soil of mixed origin, reaching usually a thickness or depth of 40 to 50 ft. The alluvials along Consuelo Creek, Carnarvon Creek, Arcadia Creek, the Brown River, and Moolayamber Creek, in this belt, are superior to anything I have seen elsewhere. They form coolibah and ironbark country. The silverleaf ironbark, which south of the Carnarvon Range favours stony ground with shallow soil, becomes in this region a denizen particularly of deep alluvial soils. This, of course, depends absolutely on the fact that silverleaf ironbark must have a sufficiently calcareous soil and good drainage to live. It can always be taken to indicate those soil properties. A limestone soil apt to get waterlogged does not suit it any better than a soil devoid of lime.

The soils of the "Upper Bowen" coal measures and limestones in the Brown River basin are very saline in nature. Saltbush, marsh, couch grasses, and other grasses which like a saline environment, predominate. The prickly-pear is spreading fast. The pear is in itself an indication of salinity, so much so that I am seriously considering the rate of the spread of prickly-pear a gauge of salt content in a formation, and hence a means of locating likely oil country.

The saline plains of Warrinilla would be fine dairy country if subdivided. Unfortunately, the pear is here spreading fast.

(TO BE CONTINUED.)

Pastoral.

PRINCIPLES OF STOCKFEEDING—I.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College, Gatton.

[The first of a series of papers setting out, as simply and practically as possible, some of the main principles of stockfeeding. Mr. Potts does not propose to delve deeply into the science of feeding, and his object is, rather, to use the results of scientific investigation in an effort to show how stockfeeding may be made more profitable.—ED.]

For us in Australia the study of the principles underlying the proper feeding of stock is more important than for those living in older countries which have years and years of stockfeeding experience to draw on. In many of these older countries, with their well-established rotations of crops—for example, the North of England and Scotland—long experience has taught men how to feed stock well merely by the process of trial and error. Now, in such countries a boy brought up on a farm learns how to feed stock without knowing why. He learns by imitating his elders. Even so, the study of the scientific principles underlying stockfeeding has been of advantage to these countries of long practical experience. How much greater must the advantage of this study be to us who have no such practical experience of generations to draw on, to us in Australia who really do not know how to feed stock?

Before proceeding to a description of what a feed consists of, let me try to give a quick example, illustrating that there is more in feeding than just filling an animal's stomach. Probably most of you in front of me are thinking or muttering that you know this, yet I venture to say that if most of you will just stop and think about the hand-feeding of stock, as you know it to be carried out by yourselves and your neighbours, you will admit—(*a*) That there is little, if any, systematic storage of fodder to feed with; (*b*) that, for cattle in particular, there is little feeding resorted to until dry conditions have so far advanced that the stock are poor, or even at starvation point; and (*c*) that when this state is reached, the object of the feeding is merely to keep the stock alive, and for this purpose almost anything is seized upon to feed—anything which the stock will eat. In brief, it is merely a question of getting something into the animal's stomach which will maintain life, but no consideration has been given as to whether the feed given is really being used as effectively as possible, while certainly no thought is given as to whether some modification of the feeding were possible whereby the feeding could be rendered a profitable undertaking.

However, for our example—

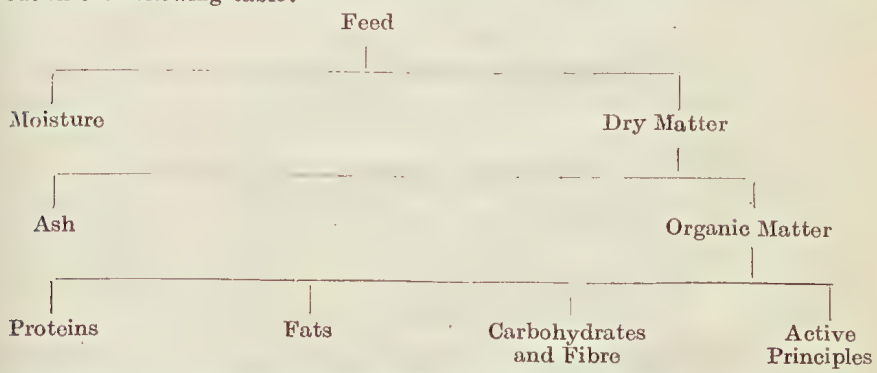
Suppose you had a steam boiler and 1 cwt. of coal. The amount of steam you could get by burning the coal would depend on a number of points. You could not expect to get good results if the boiler tubes were dirty, the chimney stack broken and full of holes, and the boiler plates covered with scale inside. Even supposing these points were in order, you could not get the best results unless the coal were fed to the firebox carefully and systematically, so as to maintain an even high-temperature fire. It is much the same with feeding stock. First, the animal to be fed must be worth the feeding, or else feeding cannot pay. Second, the feed can be given wisely or badly, resulting in good or indifferent results accordingly.

But let me take the steam-boiler example a stage further. Suppose that you have ten units of fuel, each weighing 1 cwt. and each having been got from some different source, so that one unit might be hard, clean coal, another dirty, slaked coal, a third good, solid wood, a fourth semi-decayed wood which is damp, and so on. If the boiler is fired with each of these different fuels separately, each will give a different steaming value. To know the weight of fuel used, therefore, is not sufficient. We require also to know the quality of the fuel. Knowing this latter, we would be in a position to estimate the value of each different fuel or to say how much we would be willing to pay per ton for each class of fuel. In truth, if we want to produce steam cheaply, the most important thing for us to know is the quality of the fuel. In much the same way feeds vary in quality, and we have to know the quality of our feeds if we are to feed stock successfully. With our boiler we can imagine a fuel so bad that, no matter how much we use, we

cannot keep up steam. In fact, we can choke up the firebox by using too much, but we cannot get a hot fire. Such a fuel is expensive, no matter how little we pay for it. In the same way we can have a feed which is of such poor quality that it will not nourish the animal, even though the animal can be persuaded to eat its fill of the feed. To use such a feed is mere waste of money. Again, a fuel may be so good that, even using a little of it (sufficient has to be used to keep a bed in the firebox) gives too fierce a heat, with the result that a great deal of heat is lost up the chimney-stack. It is the same with feeds for stock; some feeds are so rich in quality that quite a little of them would nourish the animal, but this amount would be too little to comfortably fill the animal's stomach and so satisfy its hunger, while if sufficient were fed to satisfy the hunger-craving, *i.e.*, to fill the stomach, a great deal of useful nourishment would be wasted by passing through the animal as dung. With our fuels we would have to blend them so as to get one suitable for our firebox. So with our feeds, we have to mix them or balance them off so as to get an efficient feed which will nourish the animal well, and usually most cheaply.

The feeding of stock is not entirely similar to the firing of a boiler. Still, the above illustration sets out fairly clearly what feeding is, and indicates the lines on which we must proceed if we are to get satisfactory results from stockfeeding.

To begin with, we will have to learn what our feeds consist of. When a feed is analysed, it is separated into quantities or percentages of the substances set out in the following table:—



First the feed is separated into moisture and dry matter. This is done by taking a known weight of the feed and placing it in an oven at the temperature of boiling water, and drying it until there is no further loss of weight. The loss in weight is the moisture present, while what remains is the dry matter. It is of importance to know the percentage of moisture in a feed, because the water present is of no value for the nourishment of the animal. The water in the feed is readily absorbed by the animal system, leaving the dry matter in the stomach for digestion. The animal gets its nutriment from this dry matter. But water in a feed will give it bulk. Hence, when an animal eats largely of moist succulent feeds it quickly gets that satisfied feeling of a full stomach, and stops eating. Soon afterwards, however, when the water of the feed has been absorbed by the animal's body, there remains in the stomach only a comparatively small amount of dry matter, insufficient to comfortably fill the stomach, and hence there results an empty void-like feeling. The small amount of dry matter thus remaining is not sufficient for a proper process of digestion, and, further, it may not be enough to properly nourish the animal. When we consider our own feed, we get a parallel case when we fill ourselves, say, with porridge. A couple of plates of porridge will send us from the breakfast-table feeling full. But a couple of hours afterwards this full feeling will be replaced by a feeling of emptiness. It is the same with stock when their feed contains too much moisture.

In truth, it is necessary to so mix our feeds that when the animal has satisfied its hunger it has taken into its stomach a sufficient quantity of dry matter.

In regard to this, some of you may state that you have fed cattle on green barley, *i.e.*, a wet, succulent feed. But I must remind you that this is not the only feed the cattle get. They are allowed to run in the paddocks, and there they pick up a considerable amount of dry grass, thus correcting the amount of dry matter.

Again, dairy stock do well on green grass. But here, again, you must recognise that the cattle, as they graze, select their own feed and adjust their ration in a manner quite beyond the power of man.

The second stage in the analysis of the feed divides the dry matter into mineral ash and organic matter. To get this, the dried feed is burnt until there is no further loss of weight. The dry matter that burns away is the organic matter, and what remains and will not burn is the mineral ash.

The organic matter contains the substances which nourish the animal, and we will consider this later. At present, we will consider the mineral ash. The animal obtains from this ash several substances which are necessary for its life. First there is the material to make the bony structure, *i.e.*, the lime phosphate (calcium phosphate) and lime carbonate (calcium carbonate). Next there is the iron which is required for the animal's blood. Again, chlorides are present in the ash, and these are necessary for portion of the digestion process.

With the exception of common salt, which we give stock as a lick, the ash of mixed feeds usually contains sufficient mineral ash to meet all the needs of the animal. We know, however, that on some country stock make good bone and thrive well, while on other country they do not. In fact, we know of some country on which young stock will not develop sound bone and on which older stock will gradually waste out their bony framework. This is undoubtedly due to some deficiency in the ash content of the feed, for on this poor country where the animals suffer from what may be termed a "*bone starvation,*" a correction can be made by feeding one of the calcium phosphates to the stock, *e.g.*, crushed bones.

Let us now consider the organic matter. In the analysis this is divided into several classes of substances, the chief of which are proteins, fats, carbohydrates, and fibre, and active principles. Each of these classes of substances plays a different part in the feeding of the animal, and this we will proceed to describe.

Proteins.—These are highly complex chemical compounds, and they all contain nitrogen. They are the most important portion of the nitrogenous part of the feed. Proteins are always associated with life, whether plant or animal. They might be termed the "life compounds." Typical examples of proteins are white of egg, casein in milk, the lean portion of meat. Proteins are manufactured in plants. They are not manufactured by the animal. Animals obtain their protein matter directly or indirectly (*i.e.*, by eating animals which feed on plants) from plants. Plants, however, do not contain large quantities of protein. The plant structure is chiefly composed of carbohydrates and fibre. Animals, on the other hand, are composed chiefly of proteins. The muscular tissue, hair, skin, nails, brain, are all protein matter. The main value of the proteins in a feed is to supply the material to build up the protein tissue of the animal. No other substance can take the place of the proteins. As the animal wastes an amount of tissue each day, just in the ordinary process of keeping alive, it is necessary that an animal should receive in its feed each day a definite amount of proteins if it is to remain alive and healthy. But if the animal is called on to work or produce milk, say, or grow, which is an increase of body tissue, or do anything in excess of merely remaining alive, so the demand for proteins in the feed is increased, being greater the greater the demands made on the animal.

If an animal is fed no proteins at all, it will remain alive for some time, drawing on the protein substance of its own body. An animal, however, cannot suffer a great reduction of its protein substance. It would soon become weak and languid, and would finally die by just fading out.

It is possible, therefore, to have what we might term "protein starvation." That is, we might be feeding ample feed as regards quantity, but this food might contain so little proteins that the animal, even though it might be fat, would die. We sometimes see this effect in children who are fed too much starchy food. They get fat and flabby, but are not healthily strong. Proteins, therefore, are the flesh and tissue builders for the animal, but, besides this, proteins can be converted into body fat (*see* below), or may be used for the production energy (also *see* below). It is important to note that the amount of proteins in plants increases up to the time when the seed begins to set. Up to this time the proteins are distributed throughout all the plant, but as the seed sets the protein matter is withdrawn from the plant and is concentrated in the seed. You can understand, therefore, why we cut a crop before the seed sets if we want to make it into hay. The best time to cut each crop varies with the kind of crop; still, the above statement holds good in its generality. Again, we should expect seeds generally to be rich in proteins, and this is so, though different seeds vary in regard to their protein content.

Fats.—The amount of fat and oil in plants is not generally large, though some seeds—for example, linseed and cotton seed—contain large quantities.

Fats are compounds which do not contain nitrogen. When digested by the animal, the vegetable fats are converted into body fat for the animal, this body fat being distributed throughout the body tissue.

Animals are able to stand big variations in the amount of body fat stored in the body. When we speak of an animal being lean we merely mean that there is very little storage of body fat. When an animal is fat and topped up, body fat is intermingled throughout the body tissue. It is this fat throughout the tissue which makes the meat tender. Thus we see we can have a third kind of starvation, namely "fat starvation."

It is fat starvation which is most obvious, because it at once appeals to the eye in the condition of the animal.

From the animal standpoint, storage of fat is merely the storage of energy in the system which can be drawn on under adverse conditions. Ultimately, therefore, the fat is converted into energy to enable the animal to move and work and maintain its body heat.

One pound of fat has about two and a-quarter times the heat or energy-producing value of 1 lb. of proteins, or 1 lb. of either carbohydrates or fibre.

The chief value of fat in the food is to produce body fat in the animal, but the fat may be used directly for the production of energy for the animal.

We do not usually feed large amounts of fat, because fatty foods are too heating.

Carbohydrates and Fibre.—There are many kinds of sugars and starches and plant fibres. All of these various substances are classed under this heading of carbohydrates and fibre. The sugars and starches, especially when pure, are readily digested and assimilated by the animal. With plant fibre, however, we have a big variation. Thus the fibre in young, green plants is fairly readily digested, while the fibre in fully matured plants—for example, in wheaten straw—is only partially digestible. Generally speaking, the more fibre a feed contains, the less digestible all the ingredients of the feed, both proteins, fats, and carbohydrates.

The carbohydrates and fibre form by far the largest part of the feed, because plants are composed chiefly of these substances. The chief function of this portion of the feed is to produce energy for the animal—energy for muscular action and the heat for the maintenance of the animal's body temperature. Beyond this, however, the carbohydrates and fibre can be converted into body fat by the animal, though the fat formed from this part of the feed is generally softer and more flabby than body fat produced from the fats in the feed.

It has been mentioned that all the fibre is not digested. This is of importance for the process of digestion. This indigestible matter keeps the stomach and intestines distended, and is the solid matter on which the feed is ground up to a fine state, so that it can be better acted on by the digestive juices. Cattle and horses and sheep require comparatively large quantities of indigestible fibre in their feeds —the cattle and sheep because of the nature of their digestive system, with its four stomachs; the horse because of the peculiar formation of its teeth, which has been developed for the special purpose of grinding up hard, dry feeds. On the other hand, pigs and human beings cannot manage feeds containing much indigestible fibre, while much the same applies to poultry. Poultry, however, have a special arrangement to assist in grinding their feed, an arrangement practically replacing the teeth of animals. This is the gizzard, which contains small stones and grit through which the feed, softened with an inflow of digestive juices, is worked and rolled until it is in a fine state of subdivision.

Active Principles.—The amount of these substances in any feed is very small, and the percentages are not shown in the analysis. Our experience, however, is generally quite sufficient to give us sufficient information with regard to this portion of a feed. Thus we know that certain feeds are laxative in their effect, *e.g.*, bran and linseed meal; other feeds are binding, *e.g.*, cotton-seed meal. Again, sorghums are poisonous to cattle at a certain stage in their growth. These differences in the feeds are due to the presence of small quantities of substance which are here grouped under the term "Active Principles." They are mentioned merely to impress on you that we have to have a knowledge of the general effects of each feed on the animal system. We have to modify the use we make of a feed in accordance with this knowledge.

Digestibility.—In the above discussion we have dealt with the composition of a feed as it would be determined by a chemical analysis. During the discussion on the fibre content of the feed, it was indicated that a part of the food was not digested. That is, that a part of the food was not dissolved in the process of digestion and absorbed by the animal system, but remained in its solid state, to be ultimately voided as dung.

Each feed differs as to the degree to which it is digested, but to determine this degree we can no longer depend on chemical analysis. Instead, we have to carry

out feeding tests with animals. The degree to which a feed is digested is called the digestibility of the feed.

It is important to know the digestibility, because it is only that portion of the dry matter of the feed which is digested and absorbed which can be utilised for the nourishment of the animal. As stated above, the undigested portion of the feed passes through the intestines and is voided as dung.

A great deal of work has been done in this matter of feeds and feeding, with the result that we now have the chemical analysis of practically all the feeds, and their digestibility has also been determined by feeding tests with animals. Combining these two, you will find in all books on feeding tables of feed analysis under the headings somewhat as follows. A few analyses are shown to illustrate the point.

IN 1 LB. OF FEED THE QUANTITY OF :—

Name of Feed.	Dry Matter.	DIGESTIBLE.				Ratio.
		Proteins.	Fats.	Carbo-hydrates and Fibre.	Total Nutrients = Proteins + Fat × 2½, + Carbo-hydrates and Fibre.	
Maize Silage	·264	·014	·007	·142	·172	1:11·3
Lucerne Chaff	·918	·105	·010	·402	·530	1:40
Wheaten Straw Chaff ..	·904	·008	·004	·352	·369	1:45·1
Maize (Grain)	·894	·078	·043	·668	·843	1: 9·8
Bran	·881	·119	·025	·420	·595	1: 4·0
Linseed Meal	·902	·302	·069	·320	·777	1: 1·6
Green Lucerne	·282	·036	·009	·121	·166	1: 3·6

COMBATING THE BLOWFLY.

OFFICIAL REPORT ON THE SPECIAL EXPERIMENTS AT DALMALLY.

Mr. W. A. Russell, of Dalmally, reporting to the Chairman, Special Blowfly Committee, Institute of Science and Industry, Brisbane, states:—

"Since my last report, dated 27th June, the work has been proceeding as usual. The fly has been more active than has been the case since the inception of the experiments, but the losses are now able to be greatly minimised, and generally can be kept at a reasonable figure.

"The results of the experiments, extending over three and a-half years, are most gratifying, and if the full results of this work could be published, it will be the means of saving the pastoral industry a large amount of wasteful expenditure. In this I refer to the number of expensive and absolutely useless specifics that are on the market, claiming to protect sheep from the ravages of the blowfly pest. Experiments will show that, generally speaking, they are useless, and give no protection at all, and, on the average, cost about 2d. to 3d. per sheep and as high as 1s.

"The experiments here have always been carried out with a careful consideration to the commercial possibility of dealing with stock in numbers, and so far the results have been gratifying, and the cost reasonable.

"The results show that all specifics which have to be hand-dressed, and the sheep cleaned up with shears before applying, have failed; and that so far one thing is of any value in dealing with the pest, and that is arsenic. This must be in a soluble form, and it has been found that it can be used with safety on sheep, young and old, shorn and woolly. I have increased the strength from 0.6 to 1 per cent., and up to this point the result has been the greater the strength the greater the efficiency. I do not think, from the results, that there is any need to go beyond this strength, as at 1 per cent. it kills all maggots within six hours. As soon as it is jetted on the sheep the maggots get uneasy; those that can get away drop off the sheep, and the others die in the wool. The sheep then has rest, can feed, and recovers. The examination of the sheep shows that the arsenic, even in the strength of 1 per cent. (which means 10 lb. of arsenic to 100 gallons of water, with of course the necessary soda ash or soda in order to dissolve the arsenic), has a healing effect on the sheep.

"The difficulty, so far, is to fix the arsenic in the wool, and so retain immunity from further infestations, which, however, as a rule are very slight if the jetting is properly done. I advocate the use of arsenic and soda only. The presence of sulphur is of very little value, if any, as a deterrent of the fly trouble; maggots will work in sulphur, but they cannot stand arsenic.

"Tests are being carried out in the laboratory as to what percentage of arsenic will kill the maggots. So far I have found that a solution of 0.125 is fatal to them, but it is rather slow, and if only jetted on in weak solutions, as the sheep dry, the percentage seems to disappear and is not effective.

"The analysis of the wool has been carried out in Brisbane by the Government Analyst, and it is due to the results obtained by him that we have been able to increase the strengths used. Graphs also have been prepared, and are, I expect, available to you. With the more recent results these graphs are instructive, and when we are quite certain of the percentage of arsenic which gives protection and immunity, this will also be included in the graph.

"Many districts suffer from fly attack over the body of the sheep, as well as the breech, so I have tried dipping in arsenic, and so far have used it up to 0.5—viz., 5 lb. of arsenic to 100 gallons of water, with no harmful results. I am increasing the strength to see what can be safely used; but owing to the possible loss of sheep in swimming them in these mixtures, only very few can be done at a time, and the results watched. These experiments I am now proceeding with, and you will have a good many of these results in my next report."

On the subject of arsenic and oil, the report proceeded: —

"It is not possible to dissolve arsenic in oil, but a good many experiments have been carried out with oil with arsenic in suspension, and these are still under observation. A very cheap oil has been found, and the cost will be very reasonable. This work is not far enough advanced yet to offer any opinion on, except that results so far have been most encouraging.

"I think that the main experiments for the coming year should be jetting with arsenic, and dipping in arsenic, as outlined in my report to you of 27th June, together with the trials of arsenic and fat, and arsenic and oil, which, so far, has proved very effective.

"The analysis of wool, I think, should be continued, and I will, as before, send samples and specifics to Mr. Henderson, unless otherwise directed by your committee."

MR. W. G. BROWN'S REPORT.

Mr. Brown, State Sheep and Wool Expert, and a member of the State Committee, in the course of his report to the Chairman, said:—

"In accordance with the instructions of your committee, I proceeded to Dalmally on the 5th October, inspected the 750 stud sheep specially used for experiments, and append herewith details.

"*Scope of Experiments.*—The scope of the experiments for the year 1921 was designed to test such of the specifics as had been found at least useful during the past three years at Dalmally, not only as to their efficacy, but from the commercial side—that is, their relative expense of operation.

"*Discussion of the Analysis.*—Taking the analysis, it will be seen, first, that with two exceptions, No. 2 in Group 1 and No. 2 in Group 3, the infestations are pretty nearly the same for all specifics. No. 1 in Group 1 was a mixture of arsenic and oil in the proportion of 0.5 per cent. of arsenic. This gave the lowest infestation of all specifics, 35 sheep. No. 2 in Group 3 gave 37 sheep infested, the arsenical contents being 1 per cent. in the jetting solution. The controls, which were untreated, naturally gave the highest number of infestations—*i.e.*, 67. Fifty sheep being used in the trials of specifics.

"Of the 750 sheep used in the experiments, 16 died from various causes, 3 only of which deaths were due to flies. It will be noted that the sheep were jetted on the 26th, 27th, and 28th January, 1921, and the 1st, 2nd, and 3rd of February, 1921. Consequently there was a period of eight months covered by these experiments.

"It will also be noticed that the first cases of infestation were observed on 5th April, about two months after treatment, but they were comparatively few to 1st July. From then onwards the infestations became increasingly greater in numbers. This, in the light of the fact that the arsenic disappears rapidly after application, is only to be expected.

"*Bad Fly Season.*—Although the flies have been very bad since February, serious infestations did not occur until July, a period of four months since the animals were jetted.

"*Amount of Specifics Used.*—The specifics were mixed and used by me personally, and the number of sheep per gallon used was about ten.

"*Infestation Proportions.*—In further discussing the analysis, it will be seen that of the 700 plus controls untreated, a total of 795 infestations were found. This shows that sheep were attacked more than once. The exact number attacked was 473, leaving a balance of 277 sheep which had not been attacked at all over the period between jetting and shearing. I carefully inspected all the sheep as they were shorn, and could see no difference between those which had been infested and those which had not, as far as constitution, breeding, or quality of fleece was concerned.

"*Rainfall.*—The rainfall over the whole period from 26th of January until 9th October is as follows:—February 66 pts., March 312 pts., April nil, May 130 pts., June 427 pts., July 841 pts., August 101 pts., September 77 pts.; total, 1,954 pts. This rainfall is considerably above the average for the period under review, and will probably account for the constantly decreasing amount of arsenic which was found in the wool as analysed by Mr. J. B. Henderson, Government Analytical Chemist, which was submitted to him periodically by Mr. Russell. Doubtless the wet season and the warm winter will account for the very great prevalence of the flies over such a prolonged period. At present writing, I have never seen the flies so numerous or so deadly: this in spite of so few dead sheep to be found in such a prolific season for herbage and grass. The whole flock on Dalmally is in splendid fettle.

"*The Sheep Experiments Again.*—In further reference to the analysis, it will be seen that the numbers of sheep to each specific, only a comparatively small number (50) was used. The greater experiments, and the ones to which I attach the most importance, were made on very much larger numbers. I shall not give close details such as the Field Book furnishes, but shall give an outline of the operations.

"*Experiments with Larger Numbers.*—No. 1: 1,600 ewes due to lamb on 18th March, were jetted with a solution of 0.6 per cent. of arsenic, soda ash and water being the solvents. On 24th May 2 per cent. were found blown, and dressed. There had, by then, been a drop of 76½ per cent. of lambs. Two per cent had died from various causes, and a small percentage of lambs had been attacked by flies. No. 2: 1,335 ewes, due to lamb on 18th March, were jetted with a solution of 0.8 per cent. arsenic in the solution. Lambing was 60 per cent., 6 per cent. were struck, and 2 per cent. were dead or missing on 27th May. No. 3: 2,680 ewes jetted with a solution, used at a strength of 0.6 arsenic. These sheep were maiden ewes, and dropped 50 per cent. of lambs; 19 per cent. were found blown, mostly very lightly. Two per cent. were dead or missing. No. 4: 1,780 ewes jetted with a solution on 27th May at a strength of 1 in 20 of water. Arsenical strength not known. Nineteen per cent. were found blown on 8th June. A percentage of 40 per cent. of lambs. No. 5: 575 ewes were jetted on the 31st May, with a solution equal to 0.8 per cent. arsenic. These ewes had been jetted three and a-half months previously. On 15th June no fly attack had occurred since jetting. Out of 1,800 ewes in this paddock only 3 per cent. were found blown, the lambing being 76 per cent. No. 6: 325 ewe weaners, seven months old, jetted on the 3rd September, with 1 per cent. arsenic; examined by me on the 11th October, and were found to be blown to the extent of only 2 per cent. The flies attack ewe weaners first in a mob of sheep, and as the pest is now at it very worst since operations began, this is a most excellent record.

"*Losses from Flies through the Year.*—Mr. Russell assures me that in this very bad season for flies his losses have been almost negligible, less than 4 per cent. in lambing ewes, from all causes, loss from flies less than 2 per centum.

"*Are Some Sheep Immune from Flies?*—A question which appears to me should be thoroughly investigated is: Why are there any sheep in a flock not attacked when flies are so numerous? In the case of the 700 stud ewes treated here, plus 50 controls untreated, last January 473 were blown, many badly, and 277 were quite untouched. There were 795 infestations on 473 sheep. Reasoning by analogy, it is known that in every herd of cattle on tick-infested country there are individual animals which do not carry ticks. May not a similar immunity be enjoyed by sheep from fly infestation? This should be a matter for serious investigation by your committee. It should not be a difficult matter to obtain, from a fly-infested flock, members which do not appear ever to be attacked by flies. It seems to me that 750 sheep running together in the same paddock in the worst fly season we have seen, should all have been struck sooner or later in the eight months they have been exposed to infestation.

"FUTURE OPERATIONS.

"*No. 1 Experiment.*—After all the sheep were shorn we decided that a hitherto highly successful experiment should be carried on further, so that the first which was conducted on only small numbers, should be proved by the second on much greater numbers (say, 3,000 sheep). We put before you our reasoning. According to

analysis, arsenic used on sheep, in the proportions we have used, will disappear or become ineffective in a comparatively short period; not more than two or three months. In an abnormally wet year, such as this has been, it is probable that the poison has been washed out of the fleece. We aimed at fixing the arsenic in the wool for a longer period. Tallow sets hard, and flies will not blow it; therefore we warmed tallow, adding a little crude oil and arsenic. This mixture sheds water when it sets. We took 325 ewe weaners and applied such a mixture in the proportion of three-quarter gallons melted tallow, 2 pints crude oil, and 2 oz. of arsenic. This mixture was applied warm in the form of a swab on the breech of the animal. A few days in a bad season for flies, such as this, will show us what value this process possesses.

"*No. 2.*—Another experiment now in operation is the use of crude mineral oil in which arsenic is in suspension to the extent of 1 per cent. arsenic. This will be swabbed on the breech of 1,000 maiden ewes, the most susceptible of all sheep to fly attack. Mr. J. B. Henderson, Government Analytical Chemist, is now trying out a theory of his, in the direction of suspending arsenic in mineral oil. When he is able to give us the method this will be used on 2,000 or 3,000 ewes.

"*No. 3.*—Mr. W. A. Russell desires to jet about 500 ewe weaners with oil alone. He has found an oil which makes the experiment, if successful, the cheapest method on the market. Not more than 1d. per head will be the cost over the whole year."

CONCLUSIONS.

Upon this data Mr. Brown arrived at these conclusions:—

"It is certain that if a jetting solution containing not less than 0.7 per cent. of arsenic be used, then ewes especially will be immune during lambing time (a period of from eight to ten weeks).

"*Arsenic.*—Although at first I was very dubious about using arsenic in comparatively strong solution as an application to minimise fly trouble, I am satisfied now that it can be used at a strength of 1 per cent. as a jetting formula with perfect safety to the animal, and with excellent results as a preventative against the fly. Mr. Russell has been fearless in its application in strong solution, and has, besides, tried out many specifics of which little was known. I regret to say that on several occasions he has lost sheep."

INFESTATION ON GROUP SERIES.

Following are the details of the analysis which Mr. Brown discusses in the course of his report:—

	Apl. 5th	Apl. 12th	May 1st	May 9th	May 13th	Jne. 6th	Jne. 14th	Jly. 1st	Jly. 20th	Aug. 3rd	Aug. 17th	Sep. 1st	Sep. 16th	Shorn Oct. 5th
Group 1—														
No. 1 ..	1	1	1	0	1	2	4	5	6	3	7	9	12	52
No. 2 ..	0	3	0	0	2	1	3	4	3	5	4	4	6	35
No. 3 ..	3	1	1	2	—	1	3	7	8	2	6	16	8	58
No. 4 ..	2	4	3	0	—	1	3	6	5	2	6	12	10	54
Group 2—														
No. 1 ..	1	1	1	0	—	2	2	4	4	1	7	10	11	44
No. 2 ..	2	2	2	2	2	3	5	2	6	7	5	8	9	55
No. 3 ..	1	2	2	1	1	2	4	1	7	5	9	7	16	58
No. 4 ..	3	1	1	1	1	3	4	8	6	6	7	11	8	60
Group 3—														
No. 1 ..	1	1	1	2	2	1	3	—	7	7	2	13	14	54
No. 2 ..	0	3	2	3	—	2	4	3	6	4	4	4	2	37
No. 3 ..	0	1	1	1	2	4	5	4	10	8	3	9	12	60
Controls														
Untreated	1	8	1	2	4	6	10	11	4	3	4	2	11	67
Group 4—														
No. 1 ..	0	1	1	1	2	1	2	4	5	6	7	8	9	47
No. 2 ..	0	3	2	1	2	3	6	5	7	2	10	12	8	61
No. 3 ..	0	6	2	1	1	3	5	8	3	6	5	3	10	53
	15	38	21	17	20	35	63	72	87	67	86	128	146	795

All specifics resisted fly attack for seven weeks.

277 equals 37 per cent. of whole number.

Sheep never infested at all.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR OCTOBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ..	31 July, 1921	1,523	3·8	64·60	
Iron Plate	Jersey ...	12 July ,,	1,072	4·8	58·40	
College Mignon ...	,, ...	7 July ,,	847	5·2	52·60	
College St. Margaret	,, ...	25 Sept. ,,	957	4·8	52·50	
Hedges Madge ...	Holstein ...	15 Aug. ,,	1,176	3·8	50·10	
Miss Security ...	Ayrshire ...	20 Aug. ,,	1,483	3·0	49·59	
Prim	Holstein ...	9 Mar. ,,	1,220	3·6	49·07	
Bellona	Ayrshire ...	26 June ,,	1,072	4·0	48·60	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	949	4·3	45·30	
College Cold Iron	Jersey ...	10 Mar. ,,	720	4·8	39·80	
Miss Betty ...	,, ...	7 July ,,	763	4·0	34·40	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	454	5·8	31·06	
Netherton Belle ...	Ayrshire ...	30 Nov., 1920	575	4·6	31·03	
Glow IV.	Guernsey ...	28 Aug., 1921	726	4·3	30·80	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	583	4·4	29·60	
Dawn of Warragaburra	Jersey ..	15 Oct., 1920	450	5·3	28·30	
Miss Fearless ...	Ayrshire ...	26 May, 1921	606	4·0	27·01	
Songstress	,, ...	4 Mar. ,,	422	5·2	26·40	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	448	5·0	26·20	
Charming Damsel	Ayrshire ...	12 May, 1921	615	3·6	25·70	
Thornton Fairetta	Jersey ...	15 Mar. ,,	377	5·4	24·40	
Snowflake	Shorthorn...	21 Dec., 1920	419	5·0	24·40	
Royal Mistress ...	Ayrshire ...	19 Mar., 1921	570	3·8	24·06	
Rosine	,, ...	19 Jan. ,,	584	3·6	23·40	
College Evening Glow	Jersey ...	10 Oct. ,,	440	4·6	23·40	
College Grandeur	,, ..	29 Dec., 1920	425	5·0	23·30	
Confidante ...	Ayrshire ...	12 May, 1921	484	4·1	22·10	
Wattle Blossom ...	Guernsey ...	21 May ,,	392	5·0	22·10	
Confidence... ...	Ayrshire ...	8 Feb. ,,	462	4·1	21·90	
Comedienne ...	Jersey ...	26 Nov., 1920	436	4.2	21·20	
Gatton Empire Lass	Guernsey ...	3 May, 1921	276	6·2	20·70	
Hedges Dutchmaid	Holstein ...	26 May ,,	557	3·2	20·40	

The Horse.

CERTIFICATES OF SOUNDNESS.

October list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
	PONIES.	
Son Harold (L) ..	N. Lochran	Mary street, Gympie
Clyorie (L)	J. W. Ross	Goomboorian, *viâ* Gympie
Bonnie Mischief ..	D. Johnson	South Side, Gympie

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, OCTOBER, 1921.

Generally speaking, the laying for the month was excellent. The following scores of individual hens are worthy of note:—H. C. Towers's "F" White Leghorn has laid a sequence of 65, unfinished; T. Fanning's "C" of 55, unfinished; W. Fraser's "A" 42, unfinished; T. Eyre's "A" of 36, unfinished; E. Morris's "A" Black Orpington completed a sequence of 51 on the 22nd of the month. The highest score for six hens among the Black Orpingtons was made by Mr. R. Burns's pen, with 165 eggs; in the light section Mr. Fanning's pen of White Leghorns laid 162 eggs. The weather during the month has been dry and warm, at times very sultry. One death occurred, viz., Haden Poultry Farm's "A" bird (White Leghorn), through blindness.

The following are the individual records:—

Competitors.	Breed.	Oct.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns	153	903
R. Gill	Do.	138	903
*W. and G. W. Hindes	Do.	152	900
*Geo. Trapp	Do.	141	855
*Mrs. R. Hodge	Do.	150	851
F. Birchall	Do.	122	837
H. C. Thomas	Do.	116	832
*H. Fraser	Do.	148	830
*H. C. Towers	Do.	141	826
*C. M. Pickering	Do.	139	813
Oakleigh Poultry Farm	Do.	105	812
*T. Fanning	Do.	162	803
R. C. Cole	Do.	121	792
W. A. Wilson	Do.	131	785
*W. Becker	Do.	132	777
*J. W. Newton	Do.	116	763
*C. Goos	Do.	136	757
H. Stacey	Do.	139	757
Mrs. E. White	Do.	132	750
Bathurst Poultry Farm	Do.	138	749
*Thos. Eyre	Do.	155	742
W. Barron	Do.	143	741
*R. C. J. Turner	Do.	139	740
M. F. Newberry	Do.	133	736
*Thos. Taylor	Do.	141	734
*E. Chester	Do.	120	729
*S. L. Grenier	Do.	141	726
*B. Chester	Do.	141	722
*E. A. Smith	Do.	148	713
*G. Williams	Do.	132	712
J. W. Short	Do.	120	706
*Mrs. L. Anderson	Do.	134	704
O. C. Goos	Do.	118	698
Mrs. E. Z. Cutcliffe	Do.	109	691
E. Stephenson	Do.	116	690
*Haden Poultry Farm	Do.	123	675
*W. and G. W. Hindes	Brown Leghorns	112	662
*H. P. Clarke	White Leghorns	136	652
Linquenda Poultry Farm	Do.	96	651
W. M. Glover	Do.	119	627
Brampton Poultry Farm	Do.	125	599

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Oct.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	149	961
*R. Burns	Do.	165	894
Rev. A. McAllister	Do.	142	882
*J. Ferguson	Chinese Langshans ...	131	875
*T. Hindley	Black Orpingtons ...	135	871
*A. E. Walters	Do.	148	863
W. Becker	Langshans	153	861
*Parisian Poultry Farm	Black Orpingtons ...	143	845
Jas. P tter	Do.	90	828
G. Muir	Do.	131	828
Jas. Ryan	Rhode Island Reds ...	131	820
*C. C. Dennis	Black Orpingtons ...	136	820
Jas. Evers	Langshans	118	817
*E. F. Dennis	Black Orpingtons ...	136	789
*E. Morris	Do.	141	779
*J. Cornwell	Do.	130	774
*E. Stephenson	Do.	111	733
*R. Holmes	Do.	111	725
*N. A. Singer	Do.	152	724
C. Cumming	Do.	112	691
*Mrs. G. Kettle	Do.	144	688
*J. E. Smith	Do.	137	686
*H. M. Chaille	Do.	115	684
*A. Shanks	Do.	130	680
J. W. Newton	Do.	126	678
*E. Oakes	Do.	140	637
F. Harrington	Rhode Island Reds ...	134	609
T. C. Hart	Black Orpingtons ...	137	532
Total	...	9,141	52,519

* Indicates that the pen is being single tested.

RESULTS OF SINGLE TEST PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	140	154	164	141	167	137	903
W. and G. W. Hindes (W.L.) ..	160	139	149	163	160	129	900
Geo. Trapp	144	135	144	139	152	141	855
Mrs. R. Hodge	140	150	156	144	151	110	851
H. Fraser	161	119	145	133	141	131	830
H. C. Towers	143	124	141	110	137	171	828
C. M. Pickering	151	139	131	116	154	122	813
T. Fanning	148	127	143	124	127	134	803
W. Becker	155	147	118	120	147	90	777
J. W. Newton	135	150	150	128	85	115	763
C. Goos	131	148	99	95	112	172	757
Thos. Eyre	129	125	85	135	138	130	742
R. C. J. Turner	129	117	117	110	132	135	740
Thos. Taylor	121	135	119	98	109	152	734
E. Chester	131	132	113	118	117	118	729
S. L. Grenier	126	145	96	124	121	114	726
B. Chester	112	119	139	112	136	104	722
E. A. Smith	151	121	123	117	112	89	713
G. Williams	166	129	93	103	111	110	712
Mrs L. Anderson	120	131	116	108	127	102	704
Haden Poultry Farm	72	106	123	123	120	131	675
W. and G. W. Hindes (B.L.) ..	97	103	94	114	110	144	662
H. P. Clarke	149	92	110	84	114	103	652

RESULTS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	96	140	182	131	169	176	894
J. Ferguson	139	134	135	162	151	154	875
T. Hindley	162	149	155	112	150	143	871
A. E. Walters	156	150	135	188	137	147	863
Parisian Poultry Farm	135	141	143	179	102	145	845
C. C. Dennis	143	127	120	150	141	139	820
E. F. Dennis	113	141	132	129	130	144	789
E. Morris	145	137	87	150	130	130	779
J. Cornwell	126	113	131	151	122	131	774
E. Stephenson	139	117	124	120	100	133	733
R. Holmes	99	119	124	131	151	101	725
N. A. Singer	122	108	116	120	111	147	724
Mrs. G. Kettle	110	130	145	75	103	125	688
J. E Smith	149	158	116	94	88	81	686
H. M Chaille	82	127	121	144	121	89	684
A. Shanks	88	114	111	123	115	129	680
E. Oakes	82	121	107	138	98	91	637

CUTHBERT POTTS,
Principal.

THE 1921 SUGAR CROP.

In June last the estimate of cut cane for the 1921 season in districts below Townsville was 2,161,000 tons. The General Superintendent of the Bureau of Sugar Experiment Stations, with his present estimate of 2,298,384, now proves the conservancy of his pre-harvest forecast. Favourable weather in the Lower Burdekin, Mackay, Bundaberg, and Wide Bay sugar areas was the main factor in this remarkable improvement in sugar prospects. North of Townsville excessive rain reduced the tonnage taken off, but, in spite of this handicap, this reduction was small when compared with the increase in the more southern canefields. In the Lower Burdekin, only 15 in. of rain were registered up to the 30th May, and the outlook then was not encouraging. Later in the growing season weather conditions improved, with the result that the extra weight of cane to be crushed in that locality alone amounts to 48,000 tons. It is now estimated that Queensland should manufacture something like 278,000 tons of sugar. If fewer tons of cane are needed to make a ton of sugar than last year, the output may be even higher. Last year's estimate for sugar consumption was about 285,000 tons, and it is stated that, for some unknown reason, this year's consumption will not be so great. Adding the New South Wales estimated production, 17,000 tons, it will be seen that the Commonwealth will have an abundance for this year, and perhaps a carryover to next season. The present estimate over the June figures is about 28,000 tons of manufactured sugar.

SOUTH COAST CANEFIELDS.

Reporting upon the Logan and Albert cane districts, the General Superintendent of Sugar Experiment Stations said that all the mills in that locality had now finished operations for the year. The crushing has been a small one, but, owing to the decline in the price of arrowroot, canegrowing has come more into favour again. In an inspection of the district, a number of new areas had been noticed under cane. The re-erection of practically the whole of the Nerang mill at Pimpama Island, by Mr. William Heck, had provided a fine crushing plant at that place, capable of dealing with from 30,000 to 40,000 tons of cane. This mill had worked very smoothly this year, and Mr. Heck deserves much credit for his enterprise in assembling so fine a plant. He expects a much larger crushing next season. The principal varieties grown about the Logan and Albert are Green Seedling, D.1135, and New Guinea 64 or "Purple Top." There is, however, far too much of the latter cane about the district, as it contains too much glucose to be a useful sugar producer. The district is now lookng well, though further rain would be welcome.

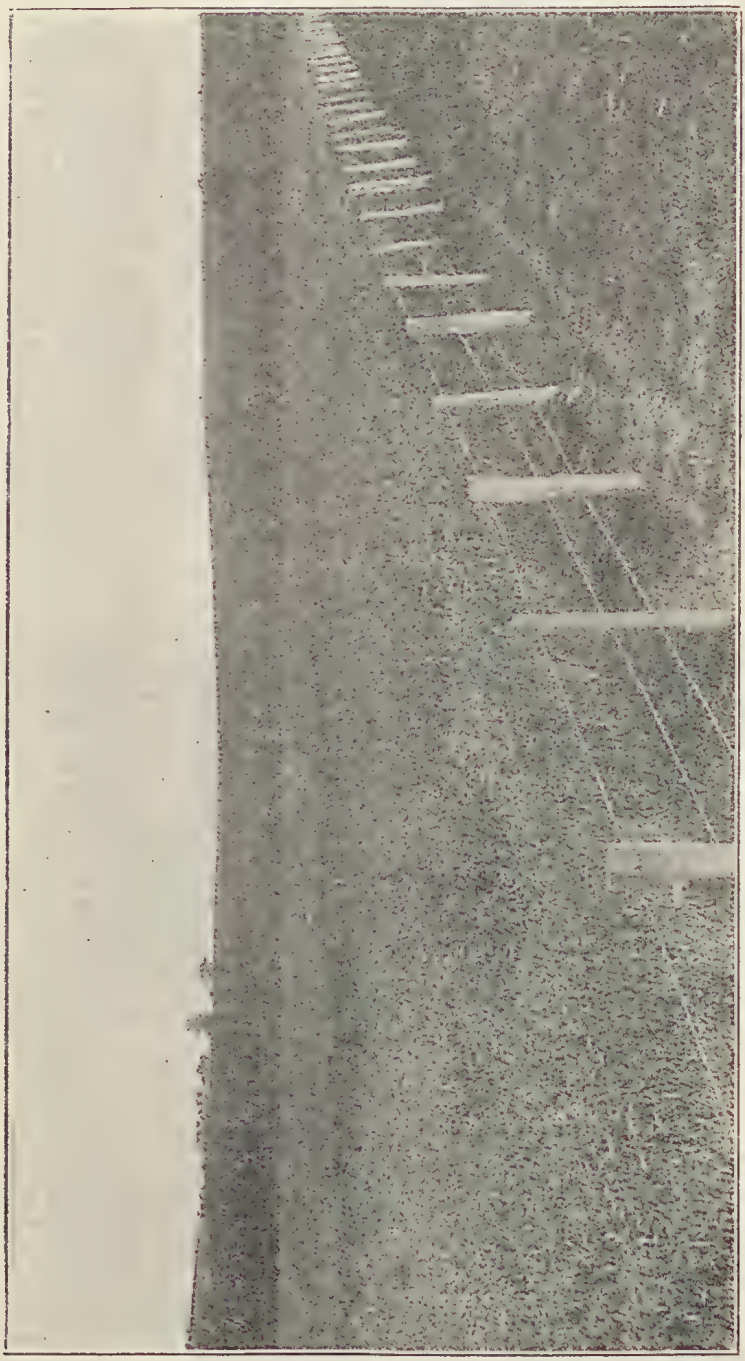


PLATE 78.—CROP OF SKINLESS BARLEY, KILLARNEY DISTRICT.

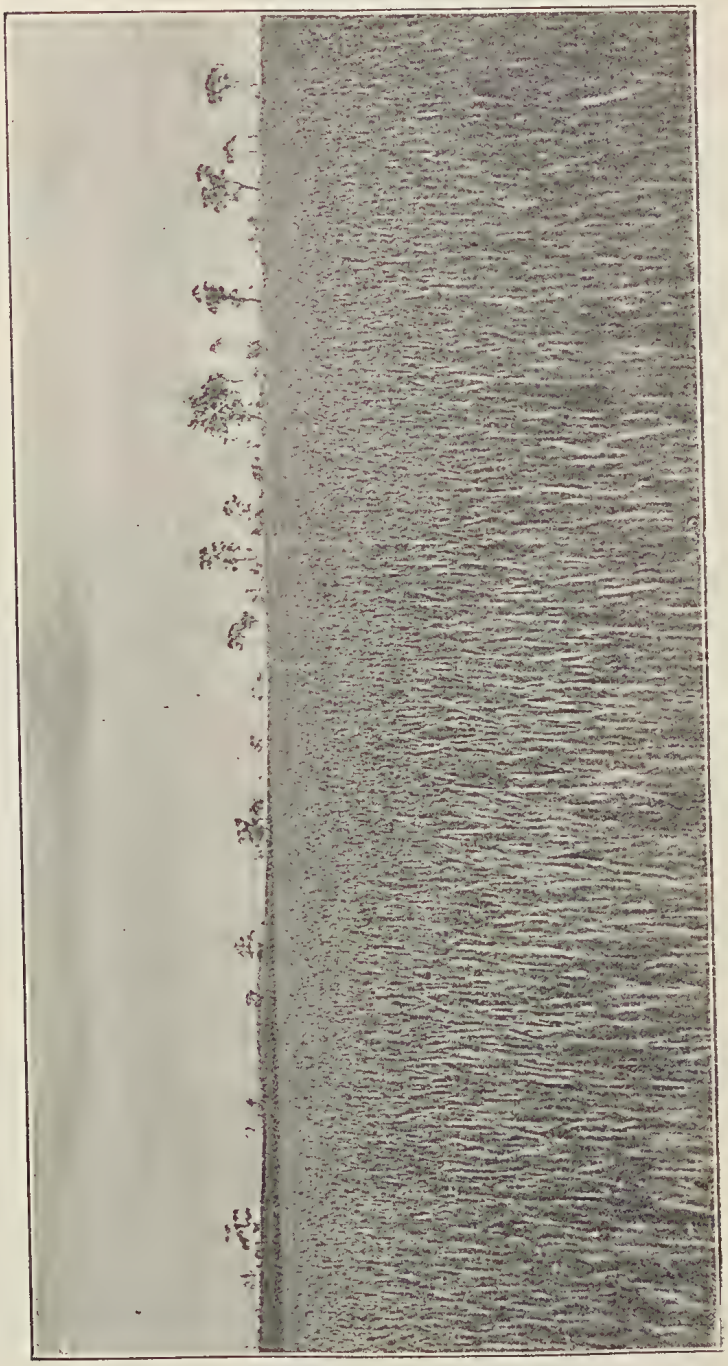


PLATE 79.—A WHEAT CROP, CLIFTON DISTRICT.

The Orchard.

THE FRUITGROWING INDUSTRY—II.

BY ALBERT H. BENSON, M.R.A.C.

In the first of this series of articles which appeared in the November number of this Journal, I pointed out that the most difficult problem by which our fruit-growers are confronted to-day is not so much how to grow fruit as how to dispose of it when grown. This matter was discussed, and an attempt was made to show that disposal is largely a matter of distribution, and that the first step to be taken to place our fruitgrowing industry on a sound basis is to bring about a better method for distributing our fruits within the Commonwealth. Suggestions were offered respecting the best methods to be adopted in order to obtain this result, and thus bring about an increased consumption of our fruit.

In the present instalment, the question of opening oversea markets for fresh fruit is considered, as a further aid towards the disposal of our surplus. This is a new departure for this State, as hitherto our exports of fresh fruit outside the Commonwealth have been confined to sending a few pineapples from time to time to New Zealand, and to an attempt made some years ago to open up a market for pineapples and citrus fruits in Canada. Much, therefore, will necessarily have to be done before we can hope to build up a profitable export trade; still, as we must find a market for our fruit if our industry is to be kept going, we cannot afford to loose any more time, but must do our utmost to solve the difficult question of determining the best methods to be adopted in placing our fruits on oversea markets in such a condition that they will not only meet with a ready sale, but will realise a price that will leave a fair margin of profit to our producers.

It is possible that there will be many failures before success is finally achieved, as I firmly believe it will be, as there is always a great deal to learn in starting a new undertaking such as sending highly-perishable fruits to distant markets; and it is only by the exercise of the greatest care in the handling and packing the fruit and by carefully conducted experiments to determine the conditions best suited to their keeping and transport that it can be accomplished. Growers must not be disheartened if success is not immediately achieved, but must remember that the apple-growers of Tasmania had many serious losses before the best means of transporting their fruit was determined, and as our coastal fruits are of a more tender nature than apples, and will require a totally different treatment, it is only to be expected that we will have many initial difficulties to overcome before we are finally successful.

The first point to be considered is: What fruits can we grow that are suitable for export? By "suitable for export" I mean fruits that, provided they can be sent successfully to distant markets, will meet with a ready sale at a satisfactory price on those markets.

The only fruits that we can grow in Queensland that, in my opinion, will meet those requirements are citrus fruits, such as superior oranges and very carefully selected mandarins—midseason and possibly late apples from the Granite Belt, and, probably, pineapples. Other fruits might be tried, but I am very doubtful of their being a success.

With respect to citrus fruits, we have the advantage of the difference in the seasons in the northern and southern hemispheres, as our main crop is in season when the main crop in Europe and America is out of season; consequently, our fruit should reach the markets on the other side of the line when they are comparatively late. The marketing of the main crop of citrus fruits grown in the northern hemisphere is nearly over by the month of May, though late ripening varieties are available, to a certain extent, right through the season up to the time that the early main crop fruit is again on the market. Our main crop oranges and mandarins ripen during the months of April, May, and June, and should, therefore, meet with a fair demand, as we could supply the home markets from the end of May to about the middle of August with high-class fruit.

That a market exists I feel certain, but the question arises: How are we going to get our fruit there? The answer is: By the exercise of the greatest possible care at this end, to begin with, to provide the right condition on shipboard and see that these conditions are maintained throughout the voyage.

The handling of the fruit at this end is, I am afraid, going to be our greatest difficulty, as our growers do not yet realise the importance of packing nothing but absolutely perfect fruit in perfect condition, and the rigorous culling of any fruit that shows the slightest defect or has received anything except the very greatest and most careful handling. Absolutely sound and perfect citrus fruit will not decay, but will keep for a considerable period, whereas a bruised fruit is a spoilt fruit that will spoil other sound fruit with which it is packed.

The rotting or, as it is termed in the trade, "specking," of citrus fruits is due almost entirely to green mould fungus, which can only gain an entrance into the fruit when the skin is injured. Fruit with a perfectly sound skin will not speck. The injury may be so slight as not to be noticeable, but yet large enough to permit of the entrance of this fungus, and may be caused by sucking insects such as scale, or sucking bugs, by the puncture of fruit flies or the larva of the spotted peach moth, by sucking moths, or a thorn prick or by rubbing or other mechanical injury, and thus it often happens that a quantity of fruit is specked whilst still hanging on the tree. Bruising caused by the gathering of the fruit frequently leads to specking, and pulling instead of clipping is accountable for heavy loss from the same trouble.

Specking can be prevented by the exercise of proper care, which means—

1. Gathering and destruction of every specked fruit in the orchard, instead of allowing it to scatter millions of spores broadcast.
2. Handling the fruit with as much care as one would handle eggs.
3. Culling every fruit that shows the slightest sign of injury.
4. Keeping the packing-shed clean and free from specked fruit.
5. Sweating the fruit for at least seven days before packing.
6. Wrapping all fruit before packing and ensuring that it is not bruised during packing or in transit.
7. Use clean cases.

All these precautions must be taken by the grower, and if he thoroughly carries them out there is no question as to the fruit carrying satisfactorily.

For many years oranges and lemons have been sent to Australia from Southern Europe as ordinary cargo, and they have landed here in perfect condition. The reason of their release on local markets in good condition is due to the fact that nothing except absolutely sound fruit is placed in the case, and that it is handled with the greatest care. This fruit stands the journey through the tropics without loss, and if we take equal precautions there is no reason why our fruit will not carry equally as well.

The Department of Agriculture of the Union of South Africa has recently devoted a considerable amount of attention to the question of the wastage of citrus fruits in transit, and has published the result of their investigation in the form of a bulletin. The results obtained show that the primary cause of wastage is "specking," due to an injury to the skin, and this is tersely summed up in the following statement:—

> "The results of the investigations show conclusively that with ordinary care and intelligent handling it is possible to place South African citrus fruits on the overseas markets showing a negligible amount of waste."

This bears out the advice that has been given by this Department for many years, and the successful export of our citrus fruits will depend very largely indeed on the manner in which the grower does his part, as the carriage of perfectly sound fruit, properly packed, presents no difficulties that cannot be easily overcome.

With respect to apples, there is no great difficulty, provided the right varieties are selected and gathered at the right stage of development, carefully graded for size and colour, and only one size of fruit of one colour is packed in a case, and that every blemished, bruised, diseased, or defective fruit is rigorously excluded.

Owing to our climatic conditions, apples suitable for export ripen somewhat earlier in this State than in any other part of the Commonwealth, and we would therefore be the first on the home market with our fruit, and for the first one or two shipments in the season we would have no Australian competitors. The oversea market demands high quality fruit; in my opinion, therefore, it will be desirable to confine our attention to three or four varieties that do well here and attempt to build up a demand for these varieties.

With regard to pineapples, this is a matter that will require some very careful preliminary experiments to be carried out on shore before an attempt is made to send a consignment overseas, as it is essential that the exact conditions under which this fruit can be kept must first be accurately determined. Over twenty-five years ago I succeeded in keeping pineapples in perfect condition in cool storage provided

with perfect ventilation, but since then a number of experiments made to cool-store this fruit have not been successful; probably owing to the fact that the temperature was much too low, and that the air in the chambers was not fresh.

When in London during the Franco-British Exhibition of 1908, I saw pineapples stored in the cellars under Covent Garden Market that had been gathered at least seven weeks, and probably eight weeks, before. They were still in perfect condition, and from this experience, as well as from the success I had in my first experiment, I am of the opinion that the difficulty of sending our pineapples home in good order will eventually be overcome.

My opinion with respect to the exportation of all Queensland-grown fruits is that the main factor that will determine the success or otherwise of the undertaking is the care that is taken by the growers to see that nothing but perfect fruit, handled like eggs, and properly graded and packed, is sent. If this is done by the growers, I have little doubt that the transport difficulties now confronting us will soon vanish, and thus another outlet for the disposal of our fresh fruits will be obtained.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING OCTOBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1921.	Oct., 1920.		Oct.	No. of Years' Records.	Oct., 1921	Oct., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·90	20	2·65	1·39					
Cairns	1·97	39	3·96	1·31	Nambour	3·20	25	1·82	7·29
Cardwell	2·01	49	5·31	5·75	Nanango	2·35	39	0 99	2 66
Cooktown	1·14	45	1·59	1·90	Rockhampton ...	1 86	34	3·35	4·19
Herberton	0·91	34	2 89	1·33	Woodford	2·65	34	1·20	3·12
Ingham	1 52	29	4 91	2 39					
Innisfail	2 98	40	5·59	3·16					
Mossman	3·10	13	4·10	3·19	*Darling Downs.*				
Townsville	1·19	50	5·78	1·23					
					Dalby	2·12	51	1·36	2·64
Central Coast.					Emu Vale	2·34	25	1·78	2·79
					Jimbour	1·88	33	1·02	2·62
Ayr	0·95	34	3·57	3·42	Miles	2 01	36	1·29	3·27
Bowen	1 03	50	3·41	0·92	Stanthorpe ...	2 59	48	4·16	2·07
Charters Towers ...	0 66	39	3 29	0 68	Toowoomba ...	2·68	49	1·33	3 82
Mackay	1·88	50	1·79	2 82	Warwick	2·25	34	2·57	2·52
Proserpine	1·75	18	2 88	2 46					
St. Lawrence ...	1·87	50	2·08	3·58	*Maranoa.*				
South Coast.					Roma	1·74	47	1·87	3·43
Biggenden	2·32	22	1·83	5·45					
Bundaberg	2·11	47	1·82	3 27	*State Farms, &c.*				
Brisbane	2 62	70	1·36	2·16					
Childers	2 52	26	1·47	9·27	Bungeworgorai ...	1·32	7	1·23	3·04
Crohamhurst ...	3 61	30	1·93	8·14	Gatton College ...	2·32	22	0·67	3 68
Esk	2·47	34	1·08	5·86	Gindie	1·44	22	0·40	5·97
Gayndah	2 44	50	0·89	5·17	Hermitage ...	1·96	15	2 50	2·95
Gympie	2·77	51	2·61	4·81	Kairi	1·06	7	2 66	1·27
Glasshouse M'tains	2 95	13	1·65	6·08	Sugar Experiment				
Kilkivan	2 69	42	1·97	3·77	Station, Mackay	1·71	24	1·60	2·15
Maryborough ...	2 77	50	0·73	4·25	Warren	2·81	7	1·10	5·46

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

LAGUNARIA PATERSONII.

NATURAL ORDER MALVACEÆ (Mallow and Hibiscus Family).

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—*Lagunaria*, a name given on account of its similarity to *Lagunæa*, a genus now included under Hibiscus, so called in honour of Andres de Laguna, a Spanish botanist, 1499-1560. *Lagunaria Patersonii* is described in the "Botanical Magazine" T. 764 (1804), under the name of *Lagunæa Patersonii*. The specific name is in honour of Colonel Paterson, a former Lieutenant-Governor of New South Wales, who collected seed at Norfolk Island and took it to England in 1792 (according to Endlicher, Prod. Norf., p. 75), where it first flowered in 1801.

Description.—(Bentham's "Flora. Austr.," I., 218) "A tree, the young parts and inflorescence more or less covered with minute scurfy scales, but otherwise glabrous. Leaves petiolate, oblong or broadly lanceolate, rarely ovate oblong, 3 to 4 in. long, entire, somewhat coriaceous, white underneath when young, glabrous and pale green on both sides when full grown, the scales of the under-surface almost disappearing. Pedicels very short and angular, bracteoles three to five, very obtuse, united in a broad, shortly-lobed cup, usually persistent at the time of flowering, but sometimes these fall off early. Calyx four to five lines long. Petals narrow, above 1½ in. long, slightly tomentose outside."

Flowers.—These are large, about 2 in. across, of a delicate lavender-pink, fading to almost white; the tree is very floriferous, producing numerous flowers for several weeks; they are borne at the axils of the leaves, and quite a long succession of bloom is provided; the flowers are very attractive to bees, and when in flower a large tree will provide at early morning a humming noise similar to the swarming of bees.

Seeds.—The seeds are borne in a capsule similar to that of the rosella; attached to the inner portion of them are numerous short barbed hairs, that will attach themselves to the skin, and are very irritating, being not unlike those of the velvet bean (*Mucuna pruriens*), commonly called "Cowitch." The seeds are also similar to those of rosella.

Timber.—"Wood firm, close in grain and nearly white, easy to work, would be useful." (Bailey's "Queensland Woods," No. 20.)

Bark.—Like a number of the plants of this Order, a very fine fibre can be obtained by maceration.

Habitat.—Queensland, in the neighbourhood of Bowen, and at Norfolk Island. Bentham, in "Flora Austr.," remarks on several small differences between the Norfolk Island form and the Queensland one. Backhouse, in his "Narrative of the Australian Colonies," 258 (1835), writing of Norfolk Island, says: "Scattered on the grassy hills is hibiscus, or *Lagunæa Patersoni*, which forms a spreading tree of 40 ft. in height. It is called "White Oak," its leaves are of a whitish green, and its flowers pink, fading to white, the size of a wineglass; it is, perhaps, the largest plant known to exist, belonging to the Mallow tribe. In a thick wood, I met with it 80 ft. high, and with a trunk 16½ ft. round."

In the Brisbane Botanic Gardens there is a fine specimen between the centre island pond and the river; it is from 45 to 50 ft. high, with a spread of about 40 ft. It flowers during October and November, and although not such a striking feature as some more vivid flowering trees, is decidedly a very beautiful sight when in flower, with its dense masses of lovely soft lavender-pink blooms, that are, however, much smaller in size than that given of the Norfolk Island form.

Propagation.—From seed or by cuttings, the tree is very suitable for street or general planting, being of compact growth, attractive appearance, and particularly free from insect pests. Mr. J. H. Maiden, in the "Forest Flora of New South Wales," Vol. I., 113, strongly advocates its planting for these purposes, saying: "The tree is very shapely, and ornamental in appearance, and is worthy of being planted

far more extensively than it is.'' When in Adelaide in December, 1919, Mr. J. F. Bailey drew my attention to a number of very fine specimens that are planted along North Terrace alternate with *Sterculia diversifolia* (Kurrajong), two Queensland trees that I am afraid have been rather neglected in their homeland.

GARDEN NOTES.

FLOWER GARDEN.—Although not a busy time for seed sowing, a few things can still be planted, such as balsams, cosmos, marigold, zinnias, celosia, and portulacca. This latter can be obtained in many rich colours, and pleasing effects may be made by grouping them in separate colours. To do this it is necessary to transplant soon after the plants commence to flower; they can be used with good results grown on newly planted rose beds in exposed situations, as the succulent green plants afford considerable shade to the surface and protect the ground from hot summer sun, without unduly robbing the roses.

Take advantage of a showery day to plant out flowering annuals available. If necessary, the plants can be sheltered by a small piece of leafy bush. Chrysanthemum planting should be finished; have stakes ready for staking when necessary. Liquid manure, occasionally applied, will put good growth into chrysanthemums, and amply repay the trouble with better flowers. Keep asters and dahlias moving, and give plenty of water in the evening. Remember, a good soaking every other day is far preferable to a light sprinkle daily. Dahlias must have a well-drained situation, and if planted in exposed situations, mulch the surface around the plants to keep the bulbs cool. Coleus and croton cuttings may be put in. Both these plants are worthy of more consideration than they seem to get; the former revel in a sheltered situation, while the latter like plenty of sun, but protection from strong winds. A suitable place should be: Morning sun up to about 2 p.m.

Lift gladioli bulbs as they ripen after flowering, and store in a dry place. Interesting work can be accomplished by the raising of seedling gladiolis, and many good kinds can be looked for if the seed is from a decent strain. In our climate the seedlings come to maturity and flower much sooner than in colder localities. Hippeastrums also provide a good field for experiment, and many beautiful kinds may be raised from selected seed.

In the bushhouse, caladiums should now be making good growth. Keep well supplied with water, give liquid manure about once a week, and cut off all flower stems as they form, unless they are wanted for seed. The growing of caladiums from seed is fascinating work, and fine results are obtained by cross-fertilisation. In selecting for this purpose, have one variety of good strong growth, without reference to any great beauty, and then cross with pollen from one of the delicate rich-coloured leaf kinds; cross both ways. Better results will follow from this system than by having two rich, delicate kinds. When potting caladiums use a rich, good leaf or turf compost, plenty of fibre through it; also small charcoal. Do not use a dense, close-setting soil; have it free and porous.

TOMATO SOUP.

An excellent product of the Returned Soldiers and Sailors' Co-operative Cannery at Stanthorpe is tomato soup, samples of which have been received at this office.

This high-quality product, well canned and attractively labelled, is rapidly establishing itself on the market as a culinary necessity, and is being favoured with a strong home demand.

WEED IDENTIFIED.

The Government Botanist, Mr. C. T. White, F.L.S., advises as follows on a weed send by Stock Inspector F. H. Singh for identification:—

''The plant sent by Inspector Singh is the fumitory (*Fumaria parviflora*), a weed fairly common in the cooler parts of the State. It is a native of Europe, and is not known to possess any harmful properties. In England it was at one time largely used as a herbal medicine for various complaints.''

Tropical Industries.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, who has been officially visiting the Sugar Experiment Stations at South Johnstone, Mackay, and Bundaberg in connection with the work of those institutions, the initiation of new experiments, and the collection of data, has returned to Brisbane. In addition to the abovementioned the sugar districts of the Herbert, Johnstone, Babinda, Cairns, and Mossman were also visited, as well as the entomological laboratory at Meringa.

At the Herbert River, although the cane was not cutting out quite so well as anticipated some months ago, it was of good quality, and sugar was being rapidly produced in large quantities for shipment south. Considerably over 1,000 tons per week were being conveyed by tram to the Lucinda Jetty, the large sugar-stores were filled, and steamers were being loaded, the whole scene presenting one of the greatest activity. The cane was being sent in remarkably clean to the Victoria and Macknade mills. No bad topping, adhering trash, or dirt was apparent. Owing to the large amount of rain experienced, the plantings of cane for next season were late, but a large area was being put under.

Disease, in the shape of what is known as "gumming," was seen in many places, notably in connection with the variety known as Clark's Seedling. Grubs were also doing damage in places. Recently the Sugar Experiment Stations shipped Tableland Badila to the farmers' associations at Macknade and Halifax, and this had germinated excellently and was vigorous and healthy. A variety known as H. 409, distributed by the Colonial Sugar Company, has also been planted out to some extent this year.

An excellent caneplanter, invented by Mr. W. J. Enticknap, of Macknade, was inspected and found to be doing fine work. It makes the drill, plants the cane, covers it, and applies fertilisers in the one operation.

The germination of some of the young cane at Macknade this year has been somewhat irregular, but as the cane is still coming through, this may yet make a good strike. The farmers generally are alive to the importance of liming and fertilising, and large quantities of these materials have been purchased this season.

At Mossman the mill has completed this year's crushing, the tonnage of cane operated on amounting to 61,500 tons. They have had a very satisfactory run and experienced good weather during the harvesting. The young cane for next season, of which there is a very large area, looks exceedingly well, and there is every promise at the present time of a good season for 1922. The directors of the mill are turning their attention to supplies of lime, and they already buy and supply quantities of fertilisers to their farmers.

In the Gordonvale district, near Cairns, the young plant cane appeared excellent in growth, the cultivation had been exceptionally good, and all fields presented a clean, attractive appearance. There has been a large area planted for next year. The crops now being treated at Mulgrave and Hambledon were lighter than estimated in the earlier parts of the year, owing to damage by grubs. Some delay was caused at Mulgrave by a cutters' strike; this, however, had ended after about three weeks' lost time at the best part of the season. Preparations for the enlargement of the crushing capacity of Mulgrave next year were going on apace. Matters generally were going smoothly at the Hambledon Mill, and here, also, the young plant cane for next season looked well cultivated and clean, while the area was large. The entomological laboratory at Meringa was inspected, and the buildings and surroundings were in good order. The work is now under the charge of Mr. Edmund Jarvis, who is exceedingly busy in laying out his campaign for the ensuing grub season and also in fighting the weevil, borer of sugar-cane, and other insect pests.

The estimate of the crop at Babinda had also been reduced, owing to excessive rains. From the beginning of January up to the 14th October 230 in. of rain had fallen. This had exercised a most prejudicial effect on the late cut ratoons of last season. The heavy rainfall also caused a good deal of the other cane to fall and die. Up to the time of the General Superintendent's visit towards the end of October, 86,000 tons had been crushed, and it was considered that another 44,000 tons remained

to be put through. The mill authorities expect to finish before Christmas, and this will give the ratoons a far better chance of coming on for next year. The sugar output is expected to be about 13,000 tons. The fibre content at Babinda in the Badila cane is very high, ranging up to 15 per cent. On the whole, the mill has worked very smoothly this year and has done slightly better than last year. Owing also to the heavy rains the plantings for next season have not been so good as last year.

The work of the Sugar Experiment Station at South Johnstone during the past year has been highly successful. The whole of the experiment work in the field has shown a large profit. First ratoon crops are averaging 43 tons per acre, and, but for the excessive rain causing much of the cane to fall and die, the yield would have been much heavier. Seedling work has also been undertaken, and a large number of new seedlings have been propagated and are now being selected and potted out.

A very heavy distribution of varieties to farmers in the Northern districts was made this year, no less than 22 tons being given out in small packages to growers. A heavy crop has been harvested and sent to the mill, both from experiment plots and land reserved for revenue purposes. The chemist in charge of this station, Mr. P. H. McWalters, had had a strenuous time during the year, and has carried out his duties with considerable zeal, energy, and ability.

The rainfall on the Johnstone River has not been so great as at Babinda, but it has been an excessive rainfall, nevertheless, amounting to 180 in. This has made the plantings for next season very late. Two strikes have occurred in this district—viz., at South Johnstone and Goondi, which have further delayed matters generally. However, both have been settled, and work is now being rapidly pushed on. The young cane is looking well and growing rapidly. The whole district is in a most flourishing state at the present moment, and large sums of money will be circulated this year.

At Mackay the district generally was looking splendid, and the cane has improved considerably since July, so that the mills have increased their estimates from 50,000 tons of sugar to 57,000 tons. Large areas of cane have been planted for next season, and the prosperity of the district is most marked.

The work at the Sugar Experiment Station at Mackay has been also most successful, and heavy crops are being cut. The distribution work has also attracted considerable attention. The variety known as Q. 813 sent out from the station a few years ago is coming into great prominence, and large areas are being planted. Mr. T. A. Powell, a grower on the North Side, cut 300 tons of this cane during the present season, averaging 40 tons per acre, with a commercial sugar content of 15.7 per cent. average. At the Palms Mill this variety has given from 16 to 16.3 c.c.s., and the manager intends planting out considerable quantities this year. The chemist in charge of the Mackay Station, Mr. F. Keogh, has (in addition to his usual duties, which he has carried out satisfactorily) made over 300 tests of cane juices for farmers, as well as analyses of soils and fertilisers.

The opening of the train service to Mackay is attracting considerable notice to the Mackay district, and will undoubtedly prove the greatest blessing to the town and country. Many landseekers held off Mackay in the past owing to its difficult port, but now it is in railway communication with the southern capitals, this fine cane district will come into its own. The change from the discomfort so often experienced at Flat Top Anchorage to the certainty of train travelling is greatly appreciated by all whose business takes them to Mackay.

At Bundaberg the cane had also improved during recent months, and the mills were dealing with larger crops than originally anticipated. Rain, however, is now urgently required for the young cane, of which a great deal has been planted for next year. The sugar experiment station has nearly completed its cutting for this year, a fine average crop having been harvested. The chemist in charge, Mr. J. Pringle, has carried out his work with care and energy, and the chemical work this year has been heavy.

Summing up, Mr. Easterby remarked that what may be termed the Southern districts, below Townsville, were generally cutting out heavier crops than originally estimated, while the districts above Townsville, owing to exceptional wet, were somewhat under the estimate, although the crops were good.

The prosperity of the sugar industry this year was something Australia had to be grateful for, seeing that the wool, mining, and meat industries were all depressed. The sugar industry was circulating immense sums of money, not only around the sugar-mills, but in many parts of Queensland and Australia, its indirect benefits being felt in other States as well as our own. It is, therefore, sincerely hoped that this great Australian industry will continue to flourish by the guarantee of its stability.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Northern Field Assistant, Mr. E. H. Osborn:—

"*Babinda.*—In last month's report I mentioned that, owing to such a heavy wet year, the tonnage to be put through by the Babinda Central Mill would be under earlier estimates.

"In connection with this, the following rainfall figures are decidedly interesting:—

The total fall from 1st January to 30th September	227.61 in.
Average fall for six years for the same period ..	119.38 in.
Fall for month of September, 1921	11.07 in.
Average fall for six years for September	6.88 in.

"These figures give an idea of the great quantity of rain that has fallen, and also the difficulty that the management has had to contend with, in order to keep up an adequate supply of cane for constant crushing purposes.

"Early in the month (October) a spell of fine weather set in, making harvesting conditions more normal, and giving the cane a chance of improving in quality. With the advent of these favourable conditions, ploughing, planting, and weeding operations were soon in full swing, hands doing their utmost to benefit by this very needed change.

"In the northern end of the Babinda area the recently cut cane was ratooning well, and some very good young plant cane was also seen. Although this end has often been damaged badly by grubs in the past, the injury caused by them this year was not great.

"Probably the amount of rain that fell so continually minimised their damaging efforts. A good number of borers was noticed in this area.

"D. 1135 has recently been planted in much larger quantities, growers claiming that it is a good striker, and certainly stands up to the grubs better than any other variety.

"The area formerly known as the "Bartle Frere Estate" looks extremely well. A lot of very fine Badila is still waiting to be cut, both on the light red volcanic soils and also upon the rich deep alluvial flats. The ratoons are coming away very well, whilst some very nice plant cane was also seen.

"Around Babinda proper a lot of new houses have been built lately, and many more also are in course of erection. The demand for new houses is very keen, any vacant one being eagerly snapped up. The State hotel has also added to its already fine accommodation, to satisfy the needs of the great number of the travellers continually passing through this important township, and the general expressions of satisfaction say much for the popularity of this public utility.

"*Freshwater.*—This district is now making very rapid progress, as the lately completed tramway bridge over the river at Stratford brings a further area of land more into direct touch with the district. The bridge spans over 600 ft., and as the entire cost so far has been borne by the owners of three farms, they are to be complimented upon their progressive policy.

"There will not be a great deal of cane brought across the bridge this year, but as there will be somewhere in the vicinity of 260 acres of land under cane in this particular locality for next year, it will be readily seen how important an undertaking it is. Most of the soil is first-class deep rich alluvial, and the young plant cane looks splendid, it having struck well and has been kept free very nicely from weeds. A shower of rain about the middle of the month also helped it along. Although, as before-mentioned, only three farms are located just here, they are well up to date, and employ tractor-power. As the soil here is very free and loose, it will be seen how popular the use of tractors is becoming, for they are being used for ploughing, cross ploughing, drilling, and planting in this class of country with every success.

"Farther up Freshwater Creek a further large area of new land is being opened up, and some magnificent young plant cane was noticed upon Mr. D. O'Hara's farm. It has struck remarkably well, is perfectly clean, and looks most healthy. As most of the areas about here were citrus orchards last year, and are now growing cane, it will be seen that no time has been lost by the growers to obtain such good results. In

the near future some very big crops of cane will be harvested from the Freshwater areas.

"*Hambledon.*—Crushing is proceeding satisfactorily, no strikes or labour troubles having so far caused any delay, and the mill expects to finish shortly prior to Christmas time. At time of my visit some very hot weather was being experienced, making harvesting conditions anything but pleasant. Quite a number of tractors are being used in this area, and their usefulness was much appreciated in the course of the hot spell.

"Although the grubs did a lot of damage to this and adjacent areas this season, it is remarkable how very well the cane is ratooning.

"The large area of young plant cane also looks well. A good deal of D. 1135 is being planted again this year, and a large number of the growers have obtained supplies of new varieties of cane from the experimental station at South Johnstone, with a view to trying same under local conditions. Unfortunately, several farmers were unable to get any plants, not having applied in time.

"Probably more manure is being used in the district this year than ever previously, and basic super meatworks, dried blood, and ammonia and others have been ordered in large quantities.

"*Gordonvale.*—There is still some very fine cane to be harvested. A patch of Badila (plant) on Mr. Sue's farm will probably cut between 50 and 60 tons to the acre. This block has been under cane for a very long time, but has been treated with filter press, had green corn ploughed in, and also had the advantage of about 10 cwt. meatworks manure to the acre. Mr. T. Shepherd, on Highleigh, claims that he has obtained some very good results from Malagache on his farm. The soil is light and porous, and was originally all forest. Mr. Shepherd's figures are—

Plant	25.0 tons per acre.
1st Ratoons	26.0 tons per acre.
2nd Ratoons	24.0 tons per acre.
3rd Ratoons	16.0 tons per acre.

" The ratoons now coming on look very healthy. Density figures for the cane were very fair.

"*Aloomba.*—Wet weather had again set in, interfering with harvesting of the present crop, and also with the cultivation of next year's cane. A good deal of young cane has been planted, a big proportion of it being D. 1135, and in most cases the strikes have been fairly good. Quite a number of farmers have also planted out new varieties obtained from the South Johnstone Experiment Station. Among these were noticed Q. 813, E.K. 1, E.K. 28, 7 R. 428, Q. 903, Tableland Badila, Hybrid No. 1, and Badila Seedling. The results of their growth will be watched with interest.

"Taking this year throughout, the weather experienced in North Queensland has been anything but favourable to canegrowing. At time of writing, rain is still threatening, making conditions very uncomfortable for the man on the land, and an early return to normal November weather is very much desired."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (4th November, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

"In the course of the month of October as much of the Mackay district as time and weather conditions permitted was visited.

"The sugar industry in this important centre is progressing more satisfactorily than has been the case for some years. The present harvest is a good one, and the c.c.s. values in the different varieties of cane are gratifying. The various mills have reached a high standard of efficiency, and the supervising chemists are to be congratulated on the percentage of extraction. Labour, taken on the whole, is efficient at Mackay this year, and no serious industrial trouble has occurred.

"The growers this year are realising more than ever the necessity for more scientific farming, and matters to which the average grower has not hitherto given much thought are being discussed and studied. Most important in this respect is the endeavour being made on the part of planters to obtain adequate supplies of lime. The obtaining of burnt lime prior to the rail coming through from the south

was almost an impossibility, but this now will be more readily obtained, and will add to the many advantages already conferred on the district by the railway. There is at present a good deal of discussion among the farmers as to which is the better to use, burnt lime or pulverised limestone.

"The former is of the more agricultural value, for the following reasons:—No amount of mechanical pulverising can reduce limestone to an equal fineness to that obtained in burnt lime that has been airslaked. On slaking, burnt lime falls into a very fine powder. When it becomes converted into a carbonate it still retains its powdery condition, and can be spread over a large surface and mixed freely with the soil. By burning, lime is brought into a caustic state. In this condition its action upon the soil and upon organic matter is more vigorous than pulverised limestone; in fact, it will bring about results in some soils that the latter would not produce at all.

"Dealing with cane varieties in the Mackay district, there are a number of canes paying the farmers well. The best of these include Q. 813, 1900 Seedling, Clark's Seedling, H.Q. 285, and D. 1135. There are a number of other promising varieties, however, that have been distributed of recent years from the Mackay Experiment Station, and these include B. 3747, Q. 1092, Q. 695, Q. 1098, Q. 135, Q. 1133, B. 3922, Q. 1121, Q. 970, N.G. 83, N.G. 103, Q. 813, Q. 458, Q. 659, N.G. 130, Q. 855, Q. 903, and M. 189. Malagache is also a variety making a good showing in some parts of the district. Yuban is growing on many farms, but ought to be rapidly discarded for reasons well known to those who grow it.

"The ratoons on many farms are coming shyly this year, and the growers are considering the application of chemical fertilisers in the form of sulphate of ammonia or nitrate of soda. I would like to make remark on the comparative value of these fertilisers.

"Regarding cane pests in the Mackay district, these appear to be causing a minimum of loss. Cane borers are present in some fields, but are well under control. Other parasites, such as leaf hopper, wire worm, and cane grub are present, but are controlled by natural enemies. In many instances the farmers are destroying the feed trees, and thus checking, to some extent, grub infestation.

"It is noticeable in a number of instances that farmers do a great deal of cultivation in young plant cane with the plough. On one hand, from the growers' point of view, this expedites the weeding and saves labour, but on the other the process is really harmful and ought to be discontinued, if possible. The harm done by this process has often been pointed out, and better tonnages would be obtained from crops that have had more careful cultivation in their early stages."

SUGAR: THE 1921 CANE YIELD.

It is interesting to compare the yield of cane in the different districts this year. It will be noticed, from the table given below, that the principal canegrowing areas are Mackay, Innisfail, Babinda, Lower Burdekin, Bundaberg, and Childers. The sugar districts north of Townsville will produce 896,000 tons of cane, while those below will yield 1,378,500 tons:—

APPROXIMATE TONNAGES OF CANE BEING CRUSHED IN THE DIFFERENT DISTRICTS DURING THE PRESENT SEASON.

	Tons.
Mossman	62,000
Cairns	176,000
Babinda and Innisfail	440,000
Herbert River	218,000
Lower Burdekin	303,000
Proserpine	60,000
Mackay	464,000
Bundaberg and Isis	479,500
Maryborough and Mount Bauple	24,000
Moreton	36,000
Beenleigh	12,000

Botany.

A NATIVE YAM.

By C. T. WHITE, F.L.S., Government Botanist.

The Instructor in Agriculture for Central Queensland (Mr. G. B. Brooks) has recently forwarded me specimens of a scrub yam, with the following report:—"I am sending a small tuber and piece of foliage of a scrub yam procured in the Dawson Valley district. In certain scrub areas they are to be found—on breaking up the land for the first time—in very large quantities. In size they are similar to the sweet potato. Pigs are said to be fond of the tubers, while the cattle strip the vines of leaves as high as they can reach. I have forwarded a few tubers to the Agricultural Chemist for analysis. In all probability a short description may be of interest to readers of the "Agricultural Journal."

The yams are the root tubers of *Vitis opaca*, a species of native grape common in coastal Queensland. The plant is very variable in the shape of its leaves and in the size of the tubers produced, and it is possible that several distinct forms or races occur. The yams sometimes attain a very large size; one collected near Redcliffe by Mr. E. W. Bick turned the scale at a little over 20 lb. weight. In the early days the yams were said to be eaten, both raw and cooked, by the aborigines. They have, however, comparatively little actual food value, as the following analysis by the Agricultural Chemist (Mr. J. C. Brunnich) shows:—

ANALYSIS OF SCRUB YAM (*VITIS OPACA*).

	Per cent.
Moisture	95.0
Crude Protein	0.75
Carbohydrates	2.23
Crude Fibre	1.08
Crude Fat	0.02
Ash	0.92

The vine also occurs in New South Wales, and is the subject of a paper by Messrs. Baker and Smith in the "Proceedings of the Royal Society of New South Wales," Vol. 40, pages 52-60. Their analysis of tubers from New South Wales plants is much the same as that given by the Agricultural Chemist.

Other Queensland species of *Vitis* produce enlarged tubers or rootstocks; Dr. Roth states that those of *Vitis acetosa* are hammered on stones and then roasted by the natives about Princess Charlotte Bay. He also states that the tubers of *Vitis trifolia*, another tropical species, are "roasted on the ashes lying over heated antbed 'chunks' or stones. The ashes are subsequently removed, the roots left on the antbeds, &c., and covered with a sheet of tea-tree bark and left to bake. The thick cortical substance is removed before eating." *Vitis clematidea* is a species common along the sea-board of New South Wales and Queensland. It produces tubers which were largely used as food, after cooking, by the aborigines.

RAT ERADICATION.

Another effective method of exterminating rats is described in the current "Poultry" as follows:—

"Put down a tempting bait and surround it with a ring of caustic soda. Outside the ring of soda place a ring of wet rags or bags. The rat, to reach the bait, must walk over the wet bags, and so wet his feet. He then walks over the caustic soda, which, of course, burns him. He will next lick off the irritating substance, and becomes a dead rat. The same procedure may be adopted at the main entrance to a rat's tunnel. Close up all the holes possible, and put wet rags at the entrance, and soda outside, and then the bait."

Entomology.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (12th November, 1921) from the Entomologist, Mr. Edmund Jarvis:—

"The warmth experienced here during the past few weeks has raised the soil temperature, and so favoured an early transformation of the pupæ of our cane beetle (*Lepidoderma albohirtum*) to the imago or beetle state. The average shade heat between the dates 10th to 17th October was 84 degrees Fahr., a temperature exceeding, indeed, that which normally obtains during our summer months. Such conditions being accompanied by a precipitation of 2.79 in. of rain, it seemed likely that about 50 per cent. of the beetles might make an early emergence. Apparently, however, this heat has not been sufficient to arouse them from a torpid state, as up to the present (28th October) no decided emergence has taken place. The past winter having been somewhat cooler than usual, it is quite possible that the beetles may not appear until early in November.

"CONDITIONS AT GREENHILLS.

"The cane on this estate, which at present consists of about 160 acres of ratoon and 90 of plant cane, is making splendid growth, the September planting being already about 3 ft. high. Mr. Hoelscher, the manager, is experimenting against the grub by burying a layer of trash directly underneath the cane, the trash being first placed in a trench, and covered by a layer of soil, on top of which the 'sets' are then planted in the usual manner. Several rows have been treated in this way, and a number of the adjoining rows left untreated to act as a check plot. About 600 acres are to be placed under Mauritius beans, one-third of this area having already been sown. The whole of the crop will be ploughed under in due course, and followed by cane to be planted early next year, when it is hoped that the grubs may feed on the humus supplied by this green manure and leave the cane alone. At present very few grubs of any sort are showing up in the furrows, and no beetles have been noticed.

"LARGE MOTH-BORER OF CANE.

"This insect, which is sometimes confused with the beetle-borer of cane, is, unfortunately, giving trouble just now in the Lower Burdekin and Bundaberg districts. Growers writing from Rita Island state:—'This pest has gradually become worse until this season, when areas in one patch have been destroyed.' 'They are very bad on my farm this year, attacking the young plant cane as soon as it is out of the ground; they clean out patches completely. They are also bad on the adjoining farms.' The larva of this moth-borer (*Phragmatiphila truncata* Walk.) does not in the least resemble that of the beetle-borer, the former being a slender caterpillar about 1½ in. long, while the latter is a plump maggot-shaped grub. The moth-borer usually attacks young ratoons and plant cane, killing the central unfolding leaves, which quickly wilt and turn brown, such plants finally exhibiting what is termed 'dead-hearts.' When occurring in big cane it is generally found boring the top of the stalk. The beetle-borer, however, seldom attacks very young shoots, and when infesting mature cane is most often seen tunnelling the basal portion.

"The moth-borer is common here in canefields, but appears to be effectively controlled by natural enemies, amongst which the well-known ant, *Pheidole megacephala*, may be considered as being an important factor. The writer has also bred from parasitised caterpillars found in bored cane at Pyramid, a tachinid fly, and a braconid wasp parasite, *Apanteles nonagrinæ*. The latter insect has previously been described as a parasite of this moth-borer in New South Wales, but has not, I believe, been recorded hitherto from Queensland.

"Judging by reports to hand regarding the mode of attack manifested by this pest on the Lower Burdekin, it appears likely that two at least of the abovementioned natural enemies do not occur there.

"We intend, therefore, to collect specimens of the parasites in question at Pyramid, and, upon obtaining same, breed them here until getting a sufficient number to convey to Rita Island for liberation on plantations where this borer is troublesome. A special breeding-cage, including about 90 cub. ft. of space, is being constructed for this work, and will contain cane plants growing naturally in soil about 9 in. deep, in order to secure ideal conditions for breeding these parasites.

"CONTROL OF THE ADULT BEETLE.

"One of the phases of control we propose investigating this coming season is that of poisoning the adult beetles before they have had time to oviposit. Experimentation in this connection will include field as well as laboratory work. Beetles will be confined separately in cages containing favourite food-plants which have been sprayed with various poisons, while feeding-trees in the forest will also be treated with similar arsenical solutions.

"Preliminary experiments of this nature were initiated by the writer in 1915 ('Australian Sugar Journal,' Vol. VII., page 62) when it was found that arsenate of lead-molasses solution proved fatal after nine days, during which time sixty-nine beetles devoured 32 sq. in. of the poisoned leaves (about ½ sq. in. to each insect). This spray, although slow in taking effect, would, nevertheless, be serviceable if administered to beetles directly they appear, as a period of about fourteen days elapses between emergence and oviposition. It is hoped, however, to discover an insecticide this season that will prove fatal in a week or less.

"It may be mentioned in this connection that amongst the numerous native food-plants of albohirtum there are two which invariably attract great numbers of beetles, viz.:—*ficus pilosa* and *ficus nesophila*. Growers who intend to collect beetles invading their canefields could not do better than plant clumps of three or four of these fig-trees on headlands or among their cane at convenient distances apart. Such trap-trees should be pruned occasionally in order to keep the heads low and spreading; and could either be collected from during the flighting season or sprayed with some suitable arsenical upon the first appearance of the beetles. Cuttings were taken from both these figs a few months back in order to see if they could be easily propagated, some being root-grafted in the ordinary way and the remainder planted without special treatment. Both methods proved successful, and I had no difficulty in 'striking' a larger percentage of these cuttings. Next season we hope to be in a position to supply young trees of both these figs, free of cost, to any growers who may care to plant them.

"BREEDING OF BORER PARASITES.

"Examination on the 25th instant of cane sticks that had been artificially stocked with grubs of the weevil-borer, and planted on 14th September in a large breeding-cage, revealed the presence in each stick of pupæ of the tachinid fly, *Ceromasia sphenophori*. These pupæ, which resulted from maggots deposited by flies collected and brought by the writer from Babinda on 22nd September, will produce parasites about the end of this month (October) and constitute our first brood for the season. The life-cycle, from larva to perfect insect, has taken, in the present instance, about forty days, but successive broods should come through during the hot weather in about five weeks. Flies forming the first brood will be used for breeding from, but it is hoped to have specimens available for distribution before next season's cane is old enough to sustain serious injury from borer attack.

"FUMIGATING PUPÆ OF CANE-BEETLES.

"In my August report allusion was made to successful laboratory experiments against the pupæ of albohirtum, our common 'grey-back' cane-beetle. Preliminary field tests conducted during September demonstrated that the fumes of carbon bisulphide are able to penetrate the walls of the pupal chamber, and injections made at a depth of 8 in. proved fatal to pupæ lying at an average depth of 11 in. Owing to prolonged wet weather these experiments had to be discontinued, but the matter will be followed up next season with view to securing further data.

"MULGRAVE NOT COLLECTING BEETLES.

"At a meeting of the Cairns Cane Growers' Association, held at Gordonvale on the 25th instant, the Mulgrave growers decided not to collect beetles or grubs this season. Such action is very regrettable, and it is to be feared that, in the event of dry weather obtaining during the period occupied by the third stage of the grub, many growers may suffer serious losses. The emergence of albohirta last season was the biggest yet observed by the writer during the past seven years, but, unfortunately, prolonged wet conditions promoted rapid growth, and in many cases the cane had attained a good length before the grubs were large enough to do much damage. Again, later on, during the critical period showers and cloudy days kept the tops green, and sticks that had fallen were able to root afresh and keep alive until crushing time. Judging from past experience in this and other countries, we may reasonably infer that cane-beetles are likely to appear this season in very great numbers."

General Notes.

WHEAT BOARD ELECTIONS.

The election of representatives on the Wheat Board, held on 26th November, resulted as follows:—

No. 1 DISTRICT.

Primary Votes.

McKeon	56 votes
Ashmore	31 „
McAnnally	125 „
Swan	257 „
Informal	7 „
Total	476 „

Number of ballot-papers issued .. 661
Percentage of electors .. 72 per cent.

As Mr. Swan therefore secured an absolute majority in the primary count, there was no necessity to count the contingent votes.

No. 2 DISTRICT.

Mr. Harvey was returned unopposed.

No. 3 DISTRICT.

Primary Votes.

Angus	23 votes
Mahony	55 „
White	85 „
Head	110 „
Kirkegaard	193 „
Informal	16 „
Total	492 „

Number of ballot-papers issued .. 657
Percentage of electors .. 74.9 per cent.

As no candidate received an absolute majority of votes, the three lowest candidates—Messrs. Angus, Mahony, and White—were struck out in accordance with the regulations governing the ballot, and the counting of their contingent votes resulted as follows:—

Angus's votes—		
	For Kirkegaard	8
	For Head	7
Mahony's votes—		
	For Head	8
	For Kirkegaard	21
White's votes—		
	For Head	27
	For Kirkegaard	22
Total for Kirkegaard		51
Total for Head		42

This, added to the former totals of Messrs. Kirkegaard (193) and Head (110), made the final totals of these gentlemen as follows:—

Kirkegaard	244
Head	152

Mr. Kirkegaard, therefore, being duly elected with a majority of 92.

No. 4 DISTRICT.

Primary Votes.

Muir	276	votes
Russell	126	„
Keable	118	„
Roché	122	„
Informal	6	„
Total	648	„
Number of ballot-papers issued	821	
Percentage of electors	78.9	per cent.

As, therefore, no candidate received an absolute majority of votes, the two lowest candidates were again struck out, and the counting of their contingent votes resulted as follows:—

Keable's votes—	
For Muir	47
For Russell	13
Roche's votes—	
For Muir	46
For Russell	12
Total for Muir	93
Total for Russell	25

These, added to the previous totals of Messrs. Muir and Russell, made the final reading as follows:—

Muir	369
Russell	151

Mr. Muir being, therefore, elected with a majority of 218.

No. 5 DISTRICT.

Primary Votes.

Chamberlain	245	votes
Hart	188	„
Garvey	100	„
Informal	1	„
Total	534	„
Number of ballot-papers issued	764	
Percentage of electors	69.9	per cent.

Again, as no candidate received an absolute majority, it was necessary to cut out Mr. Garvey, the lowest on the list, and the counting of his contingent vote resulted as follows:—

For Chamberlain	26
For Hart	14

making the final totals—

Chamberlain	271
Hart	202

Mr. Chamberlain was, therefore, elected with a majority of 69.

Answers to Correspondents.

"PATTERSON'S CURSE."

"Anxious" (Freestone).—

The Government Botanist, Mr. C. T. White, F.L.S., has identified the weed sent by you as *Echium violaceum*, known in New South Wales as "Patterson's Curse" or "Blue Weed," and in South Australia as "Salvation Jane." It is one of the worst weeds in the Southern States. It has been established in Queensland for some years, but does not seem to spread so rapidly here. It is a native of the Mediterranean, and was probably brought to Australia as a garden flower. Where it makes its appearance, every effort should be made to prevent its spreading. It does not possess any poisonous properties.

HERD TESTING.

L.M. (Millaa Millaa, *viâ* Cairns) asks: "What is the method of determining a fair average test of a cow?"

It is presumed that the word "test" means the percentage of butter-fat contained in the milk of a cow. If such is the case, the average butter-fat content of the milk of the cow may be determined with a fair degree of accuracy by taking, from time to time, what is known as a composite milk sample. A 7-oz. bottle containing added preservative, such as formalin, adding three to four drops to the bottle, is necessary. After milking, the milk should be well mixed by pouring from one vessel to another and the sample drawn immediately, and about ½ oz. of the milk is placed in the composite sample bottle upon each occasion the animal is milked. At the end of the week the milk sample bottle will be filled with milk, and the butter-fat content of this milk may be accepted as the average butter-fat content of the milk yield of the animal for the period over which the test extends.

A series of such tests may be made during the lactation of the animal, and, in turn, the average butter-fat content may be obtained from the results thus obtained, and thereby the average butter-fat content of the milk may be arrived at.

RUSSELL RIVER GRASS.

Mr. C. Hopkins (Pomona) writes:—"I am sending for identification specimens of a grass that sprung up at a place where I unloaded banana suckers from North Queensland. The grass is eagerly eaten by stock, and seems to be hardy, as it holds its own with other grasses and weeds."

The grass has been identified by the Government Botanist, Mr. C. T. White, F.L.S., as the Russell River Grass (*Paspalum paniculatum*), a species widely spread over the tropical regions of the world, and very abundant on the Atherton Tableland, Russell River, Johnstone River, and other parts of North Queensland. Opinions in the North differ as to its fodder value. On the Atherton dairy country it is looked upon as more or less a nuisance and of little value as fodder. In other parts, however, it is held to be quite a useful feed. It was boomed as a dairy grass suitable for cultivation some years ago, but did not seem to "take on," and is now rarely seen outside of the tropical regions of the State. It was named by the late F. M. Bailey as a new species (*Paspalum galmarra*), but Mr. White cannot separate it from the widely distributed *P. paniculatum*, an opinion recently verified in a letter from Dr. O. Staph, of the Royal Botanic Gardens, Kew, England, the leading botanical authority on grasses in the world.

Russell River grass should prove a useful grass in Southern Queensland, and would add variety in scrub country where Rhodes and *Paspalum dilatatum* may be said to be almost exclusively grown.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

As the wet season is expected to commence this month, provision should be made accordingly.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tynes set back at an angle to obviate dragging out of plants, but the work should be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture holding capacity of the soil. Planter's Friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass,

or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

Flower Garden.—To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Fox-hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COAST DISTRICTS

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept will worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no

acid phosphate (superphosphate) and only a small percentage of bone meal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more Southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit-fly should receive special attention, and an no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in the handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, both in the Brisbane and Coominya districts, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed and the base pips are beginning to show the first trace of colour. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and over-ripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into tight boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

The advice given in the Notes for December, to send nothing but first-class fruit to market, still holds good. With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry much beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good, firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition, is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case, and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find, when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That is must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out, a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit-fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail, then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·2	5·34	6·28	5·48	4·58	6·6	4·46	6 28
3	6·1	5·31	5·27	5·48	4·57	6·7	4·46	6·29
4	6·0	5·35	5 26	5·49	4 56	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6 8	4·46	6·31
6	5·58	5·36	5·24	5·50	4·55	6 9	4·46	6·31
7	5·57	5 36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·21	5 51	4·53	6·10	4·46	6·33
9	5 54	5·37	5·20	5·51	4·53	6·11	4·46	6·33
10	5·53	5·37	5·19	5·52	4·52	6·11	4·47	6·34
11	5·52	5·38	5·18	5 52	4·52	6·12	4·47	6·35
12	5·51	5·38	5·17	5·53	4·51	6 13	4·47	6·36
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·50	6·14	4·48	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·46	5 40	5·13	5·55	4·49	6·16	4·48	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·48	6·39
18	5·44	5·41	5 11	5 56	4·49	6·17	4·49	6·39
19	5·43	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6 19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·47	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4 47	6·21	4·51	6·42
23	5·38	5·43	5 6	5·59	4·47	6 22	4·51	6·42
24	5·37	5·44	5·5	6 0	4·47	6·23	4·52	6·43
25	5·36	5·44	5·4	6·0	4·47	6·24	4·52	6·43
26	5 35	5·45	5·4	6·1	4·46	6·25	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6 25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·26	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·27	4·55	6·44
30	5·30	5·47	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queenslan New South Wales, and Victoria, where th clock time is identical).

			H.	M.	
2	Sept.	New Moon	1	33	p.m.
9	„	First Quarter	1	30	p.m.
17	„	Full Moon	5	20	p.m.
25	„	Last Quarter	7	18	a.m.

Apogee on 14th at 6·0 a.m.
Perigee on 29th at 11·48 p.m.

1	Oct.	New Moon	10	26	p.m.
9	„	First Quarter	6	12	a.m.
17	„	Full Moon	9	0	a.m.
24	„	Last Quarter	2	32	p.m.
31	„	New Moon	9	39	a.m.

Apogee on 11th at 8·54 p.m.
Perigee on 27th at 4·30 p.m.

8	Nov.	First Quarter	1	54	a.m.
15	„	Full Moon	11	39	p.m.
22	„	Last Quarter	9	41	p.m.
29	„	New Moon	11	26	p.m.

Apogee on 8th at 6·12 a.m.
Perigee on 21st at 7·54 p.m.

7	Dec.	First Quarter	11	20	p.m.
15	„	Full Moon	12	50	p.m.
22	„	Last Quarter	5	51	a.m.
29	„	New Moon	3	39	p.m.

Apogee on 6th at 1·12 p.m.
Perigee on 18th at 7·36 a.m.

A Total Eclipse of the Sun will occur on 1st October, visible in the South Polar Region and up to a few miles south of Cape Horn.

As a partial eclipse it will be visible in the lower part of South America, but not in Africa or Australia.

The Moon will be eclipsed by the Earth almost totally on 17th October, about 9 o'clock in the morning, when it will be below the horizon in Australia.

As Mercury will be at its greatest distance east of the Sun on 8th October, it should be visible in the west soon after sunset for a fortnight or more. On the 3rd it will be to the left of the Moon, and Venus and Mars will be remarkably in juxtaposition before sunrise.

Saturn and Jupiter will pass almost directly behind the Sun on 22nd and 23rd September, and will be seen only before sunrise from about the middle of October to the end of this year.

On and about 14th November Mars and Saturn will appear to be in close proximity, and Mars and Jupiter on and about 27th November.

Venus also will be a morning star till after the end of the year

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

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PLATE 1.—WHEATFIELDS AND HOMESTEADS, YANGAN VALLEY, DARLING DOWNS, 1921.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XVII. JANUARY, 1922. PART 1.

THE 1921 WHEAT SEASON.

BY H. C. QUODLING, Director of Agriculture.

Another year has passed and another excellent crop of wheat has been garnered, now making two crops in succession which have proved to be bigger and better than any previously grown in the State. It is to be recognised that all primary products are subjected to a great deal of variation in price and, as a corollary, the producers are at times left with a very small margin of profit. However, the fact remains that wheat has done and is doing much to maintain Australia's financial position. In Queensland a distinct advance has been made. The 1920 crop proved to be a record one. Approximately 4,000,000 bushels of grain were

PLATE 2.—MIXED FARMING, KILLARNEY LINE, DARLING DOWNS.

harvested—more than sufficient to meet our own requirements—and an appreciable amount of wheat was exported. The crop was worth over a million sterling, and the average yield, 20·91 bushels per acre, was the highest in the Commonwealth.

The 1921 crop should approximate in quantity and average yield per acre that of the previous season. Although prices are not likely to be high, the quality of the grain is admittedly superior to that of 1920, being hard, bright, translucent, and of good keeping and shipping quality.

Queensland's position in respect to wheatgrowing is not circumscribed, as it is in many southern districts; here the grower has the choice of quite a variety of crops, and dairying, pig- and sheep-raising are commonly practised on wheat farms. In a sense, the soil is so productive that one is apt to overlook the fact that immense tracts of land still await development. The present is a fitting period for every patriotic Queenslander to take up a new slogan—"Wheat!" In this respect the words of "Banjo" Paterson, in his "Song of the Wheat," supply an inspiration—

"Green and amber and gold it grows
When the sun sinks late in the West;
And the breeze sweeps o'er the rippling rows
Where the quail and skylark nest.
Mountain or river or shining star,
There's never a sight can beat—
Away to the skyline stretching far—
A sea of the ripening wheat."

PLATE 3.—"A SEA OF THE RIPENING WHEAT."

Those who recently had the privilege of seeing our magnificent fields of wheat have spoken in no unmeasured terms of appreciation of all that they stand for. Others, not so favourably situated, may be able to form some idea at least of everyday scenes during harvest time from the series of illustrations presented with this article.

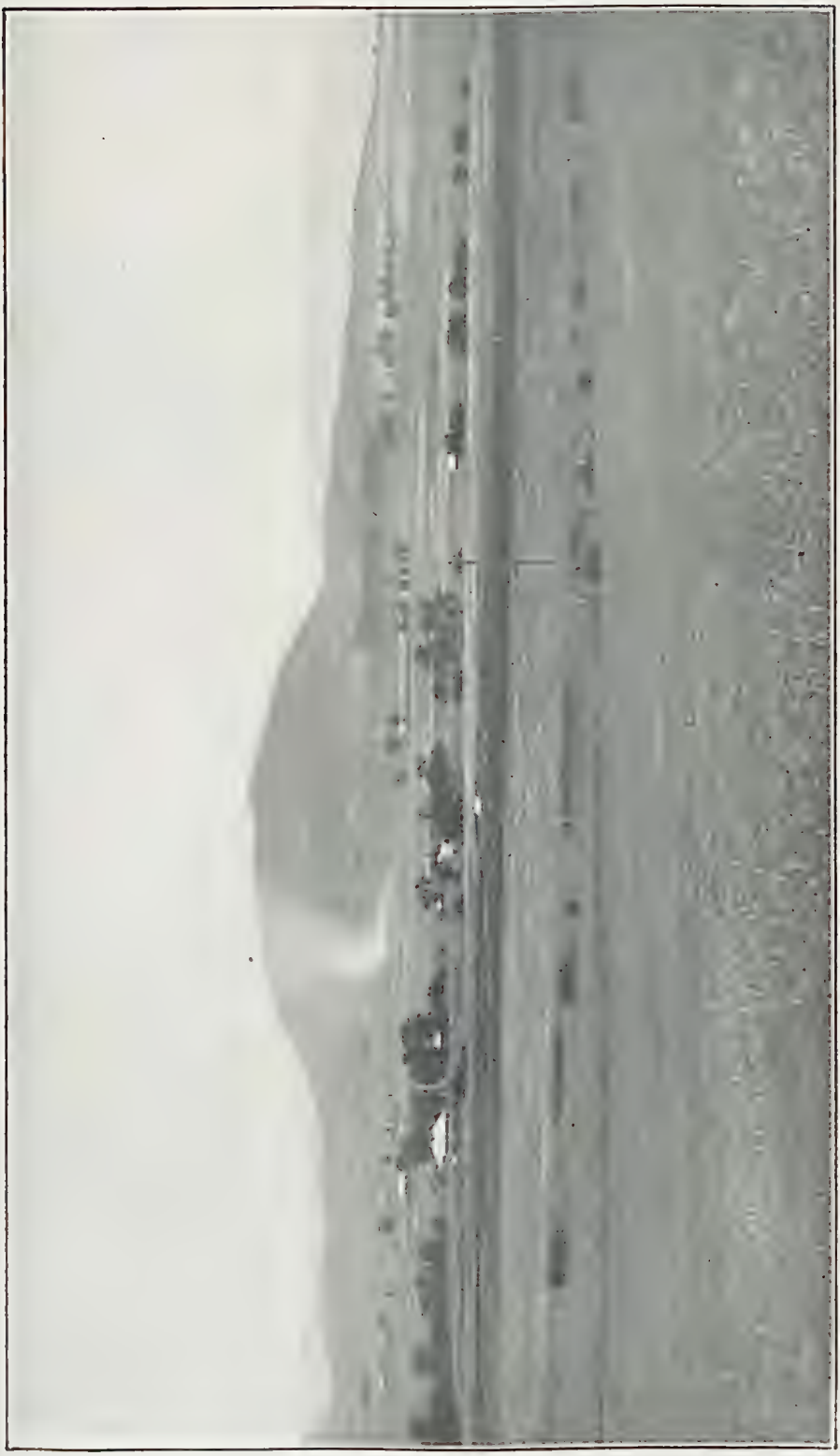


PLATE 4.—TYPICAL WHEAT COUNTRY, DARLING DOWNS.

PLATE 5.—HARVESTING "FLORENCE" WHEAT, ALLORA.

Last year was the first occasion wheat was marketed on co-operative lines under the 1920-21 Wheat Pool Bill, a measure which enabled growers to receive the fullest possible value for their grain, and it is a significant fact that a majority of these growers voted for a continuation of the Pool, which is now being carried on under the same chairman and manager; but three out of five members of the elected "Board" are recent nominees.

PLATE 6.—FIELD WORK, AFTER MORNING TEA, ALLORA.

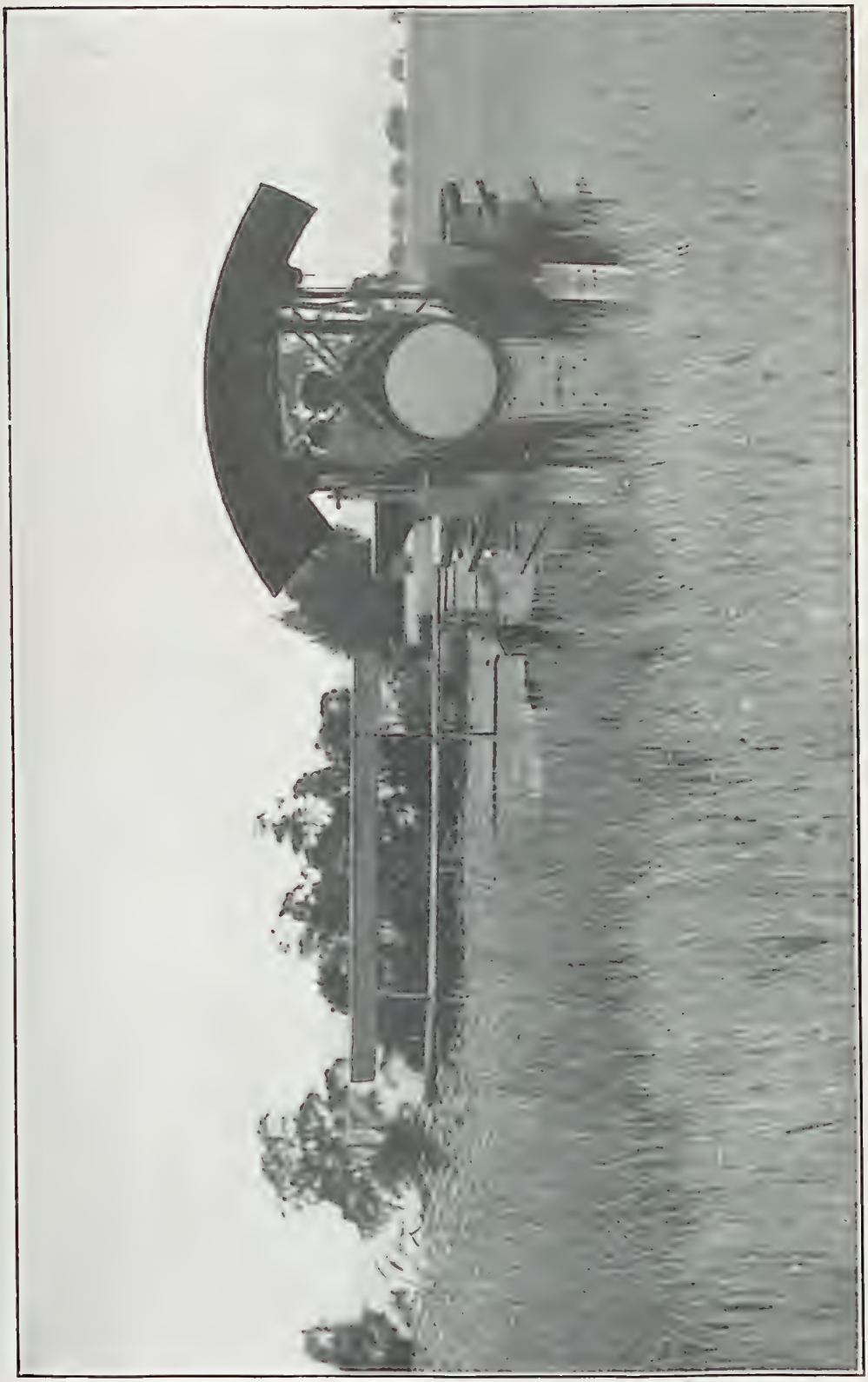


PLATE 7.—TRACTOR-DRAWN REAPER-THRESHER TAKING OFF A 10-BAG CROP OF "PLATRE" WHEAT, MR. C. DAVESNE'S FARM, MOUNT STUART.

A review of the season indicates that it was generally favourable for production, and although storms and hail beat down the ripening wheat in some localities, the losses were much less than those occasioned by these causes to the preceding crop. Damage was done in a few places by a visitation of caterpillars and grasshoppers (locusts), but these pests appeared late in the season, and this circumstance somewhat curtailed the period of their depredations. A heat wave also reduced the natural succulence of the plants, and, although causing premature ripening of crops, it had an effect of depriving the insects of soft, palatable food.

"Flag" rust was in evidence in most crops; subsequent damage, however, by the more harmful form of rust which attacks the stem of the plants was restricted to varieties susceptible to attack, and to crops which were either too succulent or had lodged on rich patches of soil.

The rains necessary for germinating seed were delayed until the second week of June. Harvest prospects, however, proved so encouraging that numerous orders for modern harvesting machinery were placed by growers who are keeping abreast of the times in the matter of labour-saving appliances, it being generally recognised that success can only be attained by keeping down the cost of production.

Wheat ripens earlier in Queensland than in any of the Southern States. In the neighbourhood of Mitchell and Roma it is often in the bag by the second week in October; this season the harvest proved a little later than usual and commenced about the last week of that month. Quick-maturing wheats were being harvested throughout the Darling Downs at the latter end of the first week of November. These, and the main crops were removed under fairly satisfactory harvesting conditions, but wind storms and hail affected some late-harvested areas.

PLATE 8.—A BUSY SCENE, CLIFTON RAILWAY STATION.

Taking all things into consideration, the reduction in the aggregate amount of wheat harvested, due to various disabilities, amounted to only a small percentage.

Busy scenes are to be witnessed at all centres where deliveries of grain are being made, and although the "stripper" of "Banjo's" day has given place to the more economical and modern system of harvesting by means of the present day "reaper-thresher," his words, in the following lines, carry a world of meaning:—

"When the burning harvest sun sinks low,
And shadows stretch on the plain,
The roaring strippers come and go
Like ships on a sea of grain,
Till the lurching, groaning waggons bear
Their tale of the load complete.
Of the world's great work he has done his share
Who has garnered a crop of wheat."

A retrospective view of the history of wheatgrowing in Queensland indicates great variation in yield and in the aggregate area annually put under crop.

For a number of years the average yield, over a ten years period, was slightly in excess of other wheatgrowing States in the South, and the distinction of attaining the highest average yield per acre for any one year, with 20·91 bushels per acre, belongs to Queensland; however, the mean for the last decade now places this State third on the list, a position brought about by three abnormally dry years—1911, 1915, and 1918.

The mean for ten years is shown hereunder—

	Per acre.
Victoria	11·91 bushels.
New South Wales	10·67 bushels.
Queensland	10·40 bushels.
South Australia	10·35 bushels.
Western Australia	8·91 bushels.

It is generally recognised that the soils on the major portion of the area cropped with wheat—the Darling Downs—are deeper than they require to be, and are also, if anything, too rich for the crop; moreover, that better and more consistent results would be attained if systematic effort were made in all farming operations to trap and conserve moisture, particularly the summer rains, which, after percolating to the subsoil, can be largely stored there for the benefit of subsequent crops. Proof of what is possible in a dry year may be instanced from a crop of "Warren" wheat which yielded a few seasons ago 24 bushels to the acre at the Roma State Farm, on an effective rainfall of only 1·76 in. during the growing period of the crop. Prior to planting the seed, good summer rains fell. Success is to be attributed to the fact that the whole of the cultivation was directed towards putting the ground into condition to receive a maximum amount of moisture, and holding it there by the maintenance of a well-worked soil mulch.

PLATE 9.—FALLOWING LAND AT ROMA WHEAT-BREEDING FARM, MARANOA DISTRICT.

If the possible failure of crops were to be overcome by evolving a wheat to withstand dry conditions, the matter of obtaining suitable varieties would be a matter of rigid selection of hardy types with a deep-rooting system and certain other essential botanical characteristics. Here, however, climatic conditions are variable, and at times conducive to rust, particularly in good seasons, when over-succulent crops are the rule, which latter form an ideal host for the propagation of rust spores; consequently, it was only to be expected that, whilst rust-liable wheats remained in cultivation, heavy losses were inevitable. Twenty-five years ago the Department of Agriculture and Stock, seized with the importance of bringing more suitable varieties into general cultivation which would combine rust-resistance and desirable field characteristics with grain of good milling and nutritive qualities, decided on a policy calculated to bring about the desired result.

Wheats were introduced from countries in different parts of the world and tested on farms, principally on the Darling Downs. It is of interest in this connection to recall the fact that "Marquis," a strong flour, red Fife type of wheat, was imported by the Department more than a decade ago, and is now favoured in a number of localities for mid-season sowing. The scheme of importing special kinds of grain and testing them had its limitations, and, in consequence, a more systematic effort was made to co-ordinate the work, to collect data concerning the behaviour of introduced wheats, and to admit of their classification and correct nomenclature and the control and distribution of varieties that had proved suitable. Two State farms were established—one at Westbrook, near Toowoomba, and another at Hermitage, near Warwick. Wheat improvement and experiment work were initiated at these institutions. Certain tests were also carried out in co-operation with Southern

Agricultural Departments. Later on, all the wheat selection work was transferred to Hermitage. It was soon found necessary to extend the scope of operations, and to test special wheat selections made at the farm on different soils, under variable climatic conditions. This field plot work, in conjunction with Departmental laboratory and milling tests, afforded more scope and was the means of introducing a number of valuable varieties into cultivation. Notable wheats from this source now found more or less in the principal wheatgrowing districts are "Amby," "Bunge," "Piastre," "Coronation," "Hiawatha," and "Hermitage Nos. 1 and 2."

PLATE 10.—A FIELD OF "HERMITAGE NO. 1" WHEAT, ALLORA.
YIELD, 11 BAGS PER ACRE.

The necessity arose for the establishment of another permanent establishment at Roma, where wheatbreeding and cultural tests could be carried on under drier conditions common to localities considered to be well suited for wheat production.

For the last twelve years careful and systematic work has been effected. A similar system to that previously referred to, of establishing field test plots, was continued, with the result that some excellent varieties have been added to wheats now in cultivation. Some of the newer varieties include "Soutter's Early," "Inglewood," "Patriot," "Cedric," and "The Prince."

Many of these new varieties from Hermitage and Roma State Farm have found favour with wheatgrowers; good yields, ranging from 7 to 12 bags (3 bushels each) of wheat were harvested from fairly large fields. Facts of this character show an accomplishment of purpose which is exercising a healthy influence in the choice of wheats suited to Queensland conditions. Work of this latter description is being vigorously carried on, and quite a number of new "crossbreds" evidence a capacity to mature quickly and escape rust, whilst others are equally promising in respect to rust-resistance.

Apart from Departmental varieties of wheat, several other kinds are commonly met with and find favour amongst growers, according to varying conditions of soil and climate and their relative sowing periods

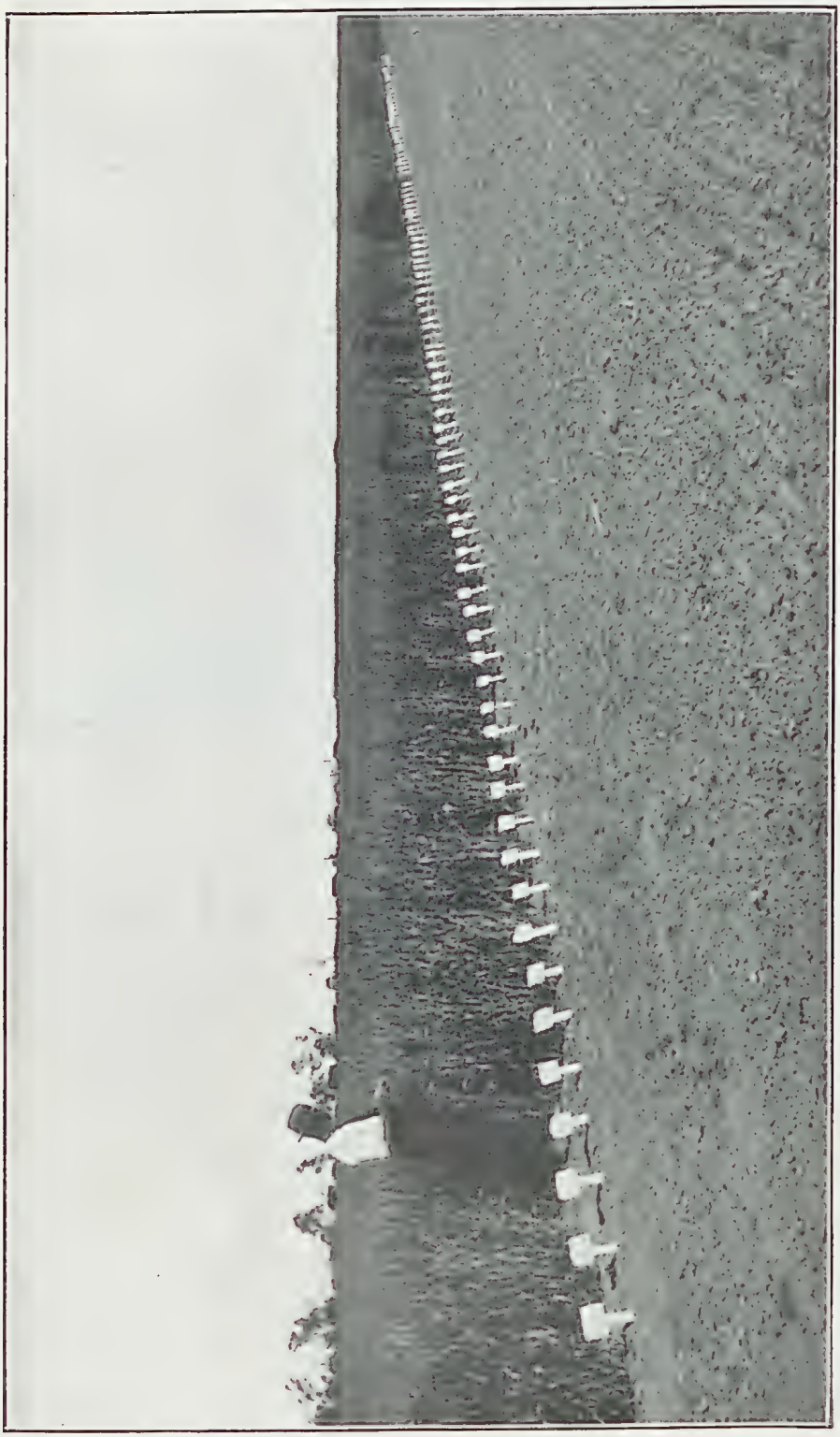


PLATE 11.—ROMA WHEAT-BREEDING FARM, MARANOA DISTRICT.

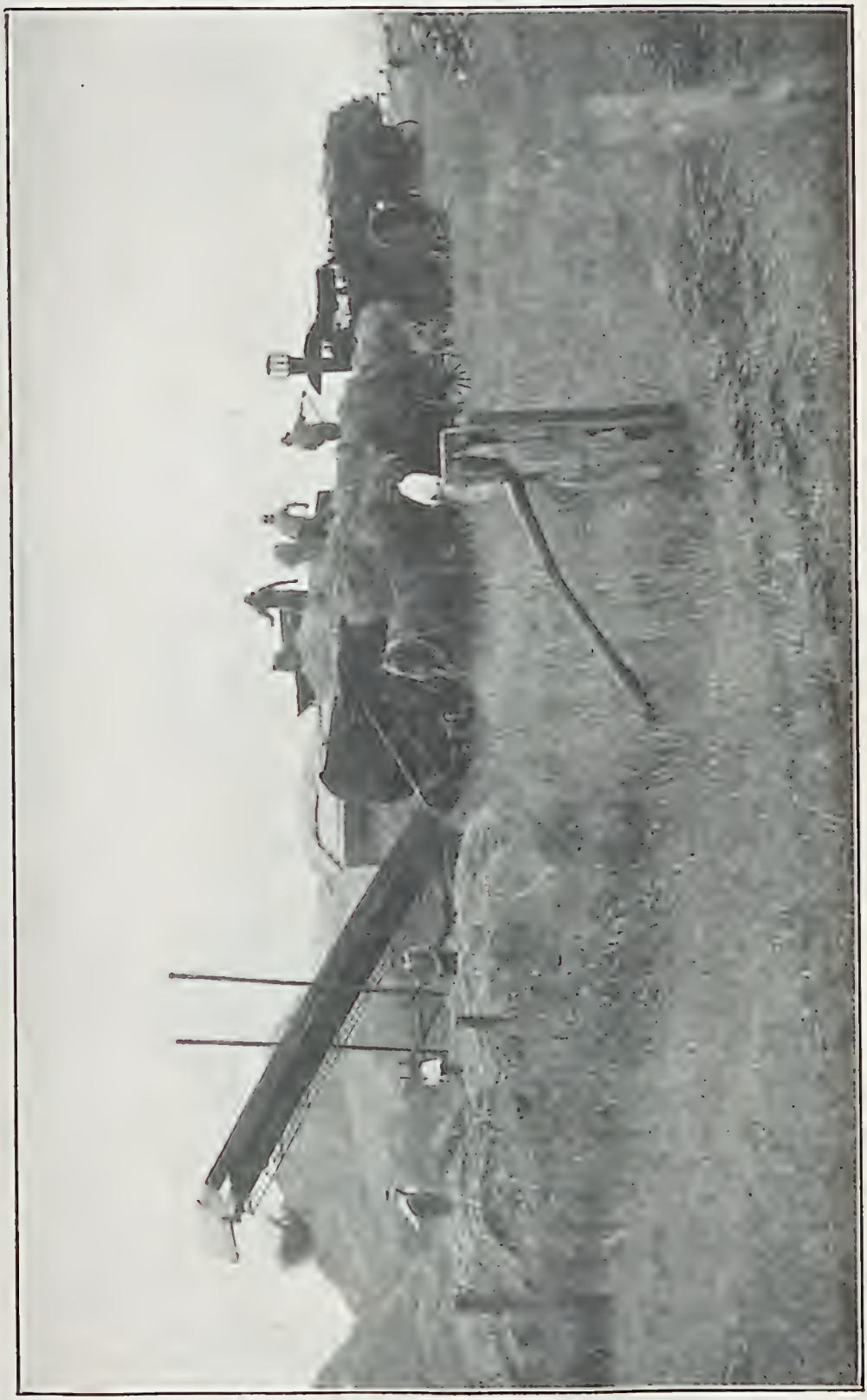


PLATE 12.—THRESHING FROM THE STOOK, NOBBY, DARLING DOWNS.

during the season. Chief of these are "Florence," "Comeback," "Marquis," "Cedar," "Cleveland," "Warren," "Gluyas," and "Currawa." Such a thing as a perfect variety of wheat to meet all conditions is practically unattainable. However, mention should be made of the adaptability to Queensland conditions shown by "Florence," a New South Wales variety. It is bunt- and rust-resistant, possesses a firm, fairly strong straw, and is a quick maturer. These excellent qualities outweigh other disabilities in the way of susceptibility to frost and a tendency of the grain to "shatter."

Excellent characteristics may also be claimed for many of the newer wheats introduced by the Department of Agriculture in Queensland.* Obviously, growers will advance their own interests by testing some, at least, of these, by sowing them at seasonable periods to determine whether such, or any variety, is superior to the varieties commonly grown.

Favourable seasons naturally account for a great deal in the production of all crops, but success in the main is only to be won by the indomitable will of the wheatgrower, whose outlook on life Mr. C. J. Dennis crystallises in his "Backblock Ballads":—

"When the settin' sun is gettin' low above the western hills,
When the creepin' shadows deepen, and a peace the whole world fills,
Then I often sort o' soften with a feelin' like content,
An' I feel like thankin' Heaven for a day in labour spent,
For my father was a farmer, an' he used to sit an' smile,
Realizin' he was wealthy in what makes a life worth while.
Smilin', he has told me often, 'After all the toil an' heat,
Lad, he's paid in more than silver who has grown one field of wheat.'

"Wheat, Wheat, Wheat! When it comes my turn to meet
Death the Reaper, an' the Keeper of the Judgment Book I greet,
Then I'll face 'em sort o' calmer with the solace of the farmer
That he's fed a million brothers with his Wheat, Wheat, Wheat."

PLATE 14.

". . . . . with a feelin' like content,
An' I feel like thankin' Heaven for a day in labour spent."

* Approximately a million bushels of wheat were harvested in 1920 from varieties raised and brought into cultivation by the Department of Agriculture and Stock.—Ed.

SOME NOTES ON THE SOILS AND FOREST FLORA OF THE DIVIDING RANGE—NORTH OF ROMA.

BY H. I. JENSEN, D.Sc. (SYD.).

(Continued from December "Journal.")

WESTGROVE—GLENHAUGHTON COUNTRY.

Between Injune Creek and the Carnarvon Range lies an expanse of country, most of which has been or is part of Westgrove Station. Between the Expedition Range and Taroom lies an expanse divided up into several cattle stations, principal of which is Glenhaughton.

These two areas, which we name after the principal stations on them, are very similar in nature, consisting of "Bundamba" sandstones in the northern parts, passing into Lower "Walloon" rocks of a highly calcareous nature in the southern and south-eastern parts.

The country met with in these two areas has a somewhat better rainfall, and possesses more coastal climatic conditions than the areas already described. As a result of this we get the soils more leached than the equivalent soils in other areas mentioned above, and the timber is a curious mixture of coastal and inland species.

The "Bundamba sandstone" soils are naturally a shade better on Westgrove than on Glenhaughton, owing to climatic differences and leaching conditions, but both are poor areas, not at all well suited for subdivision into small grazing selections. It is country like that of the Brown basin and Upper Nogoa one would like to see subdivided.

The "Bundamba" soils (sandstone) on Glenhaughton are so leached and poor that they are quite similar to our Bundamba sandstone areas in coastal parts, near Brisbane. They are so poor and sandy that the prickly-pear seldom transgresses on to the area, and will not spread across it; it is as effective a barrier to pear as the sandy sandstone soils of the Burpengary district are to the prickly-pear patches on the coast. This great sandstone area reminds one greatly of the Blue Mountains district of New South Wales in scenery, soil, climate, and vegetation. In the flowering season it contains a marvellous display of flowers like the sandy plateaux of the Blue Mountains. The forest trees include a profusion of acacias, amongst which the following are very abundant:—*A. Cunninghamii, A. Bancrofti, A. juncifolia, A. flavescens, A. polybotrya,* and *A. neriifolia.* Amongst the eucalyptus species we have ironbarks (*E. decorticans, E. melanophloia,* narrow-leaved var., *E. crebra,* not common, spotted gum (*E. maculata*), also var. *citriodora* (lemon scented), crooked or tumble-down gum (*E. dealbata*), Moreton Bay ash (*E. tesselaris*), stringybark (*E. acmenioides?*), bloodwood (*E. terminalis*), yellowwood (*E. Watsoniana*), and yellow bloodwood (*E. trachyphloia*). Pine (*callitris glauca*) occurs in belts. Dogwood (*Jacksonia*), stunted trunkless zamia, quinine (*petalostigma*—a tree variety, quadriloculare, and a low shrubby variety), boronia, &c., are also conspicuous. Hoveas, hardenbergias, grevilleas, hakeas, ricinocarpus, pultenea, and other genera were identified by Mr. White. Oak (*camarina torulosa* and *C. inophloia*), budgeroo (*Lysicarpus*), are also common. Finally, *Tristania suaveolens,* a coastal timber (swamp mahogany) is fairly abundant.

The "Walloon" shales and sandstone area of the Taroom district has excellent calcareous soils, similar to those already described for Injune Creek and Durham Downs, north of Roma. These soils are heavy black, brown, and chocolate soils, with brigalow-belar scrubs, patches of open plain; myall (*Acacia pendula*), wilga (*Geijera parviflora,* sandalwood (*Eremophila Mitchelli*) are also common in association with brigalow (*A. harpophilla*) and belar (*Casuarina lepidophloia*), or in belts by themselves, and bauhinia, together with *Cadellia pentastylis* (ooline or Taroom solidwood) are abundant in the same thickets. These trees are uncommon in the Injune Creek brigalow scrubs. In some of the Taroom scrubs we also see a considerable admixture of the plants belonging to the coastal scrubs. This is particularly the case in the range between Broadmere and Glenhaughton, where the scrubs are partly on soils derived from volcanic trachyte flows capping the summits. Throughout this rich-soiled area the prickly-pear is spreading with most alarming rapidity. The country, but for this fact, would be most attractive dairying and agricultural land.

Another belt of geological formations occurring north of the "Bundamba" sandstone belt in these areas is the belt of "Ipswich" formations, which is divisible into—

(*a*) The shales, limestones, and calcareous sandstones with typical calciphile flora and rich heavy soils in which prickly-pear is rampant, and where on the forest areas we get Moreton Bay box (*Tristania conferta*), molly box (*Eucalyptus cambageana*), and poplar box (*E. populifolia*); and

(*b*) The sandstones of the same series, which are of a micaceous-felspathic nature, with good and light loamy soils suited for agriculture, where the country is not too rough and timbered with spotted gum (*E. maculata*), silverleaf ironbark (*E. melanophloia*), and tree zamia (*Macrozamia Moorei*).

These belts are found in the area at the head of the Robertson, Roper Pass, Ruined Castle Creek, and Bedourie.

THE DRUMMOND RANGE.

The rocks of the star formations at Bogantungan and on the tributaries of the Nogoa and Belyando, in the Drummond Range district, are divisible into an upper calcareous shale series and a lower sandstone series. The former series yields good pastoral country, timbered chiefly with silverleaf and narrowleaf ironbark; the latter is poor sandy country with the usual calciphile flora ironbark (*E. siderophloia* and *E. crebra*), sugar gum (*Angophora lanceolata*), Moreton Bay ash (*E. tesselaris*), yellow bloodwood (*E. trachyphloia*), quinine (*petalostigma*), &c.

On the flats where the soils mix we get the yellow-jacket (*E. Watsoniana*), bloodwood (*E. terminalis*), and the cabbage gum (*E. papuana*). There is no particularly good country in the Drummond Range as far as I have been, since the calcareous strata through the roughness of the country yield only shallow soils. The soils are exceedingly dry. The same belt where it occurs on more level country should yield fair soils.

Much more could be said, but all I desire is to emphasise the fact and add some more data in proof of the contention that this subject is important both to agriculture and forestry.

TABULATION OF FLORA COLLECTED BY JENSEN AND DUNLOP; DETERMINED BY MR. WHITE, GOVERNMENT BOTANIST; GEOLOGICALLY CLASSIFIED.

CALCAREOUS WALLOON COUNTRY AND CALCAREOUS SOILS, IPSWICH-BUNDAMBA JUNCTION.

Calciphile Vegetation.

Botanical Name.	Vernacular.	Locality.	Remarks.
Eucalyptus melanophloia	Silverleaf ironbark	Widespread	On stony ground
E. populifolia	Broadleaf box	Widespread	On heavy soil
E. tesselaris	Moreton Bay ash	Uncommon	Chiefly on sandy areas
E. dealbata	Tumbledown gum	Cornwall, &c.	On sandy soils
E. rostrata	River gum	Common	Along watercourses
Acacia Cunninghamiana	Wattle	Injune Creek and widespread	On loamy soils
A. Bancroftii	Wattle	Jack's Mountain (rare)	In brigalow-belar scrub
A. homalophylla	Narran	Jack's Mountain and Orallo	In brigalow-belar scrub
A. harpophylla	Brigalow	Very widespread	
A. decora	Wattle	Kilmory, Injune Creek, &c.	Common on lime-rich soil
A. pendula	Myall	Myall Downs, Mount Hutton	Common on lime-rich flats
A. dealbata	Wattle		
Casuarina lepidophloia	Belar	Very widespread	On sandy calcareous loams
Angophora intermedia	Apple	Widespread	Along creeks
Alphitonia excelsa	Red ash, Whiteleaf	Jack's Mountain	Common in brigalow-belar scrubs
Atalaya hemiglauca	Whitewood	Jack's Mountain	Common in brigalow-belar scrubs
Canthium oleifolium	Orange	Jack's Mountain	Common in brigalow-belar scrubs
Canthium buxifolium	Orange	Jack's Mountain	Common in brigalow-belar scrubs
Capparis Mitchellii	Orange	Jack's Mountain, Boxvale, &c.	Common in brigalow-belar scrubs
Capparis lasciantha	Orange	Jack's Mountain (creeper)	Common in brigalow-belar scrubs
Cassia australis		Injune Creek	Common in brigalow-belar scrubs
Carissa ovata	Prickly turkey bush	Injune Creek, &c.	Common in brigalow-belar scrubs
Cassinia lævis	Rosemary	Jack's Mountain and Mount Hutton	Common in brigalow-belar scrubs
Cassinia quinquefolia	Rosemary	Injune Creek	Common in brigalow-belar scrubs
Cassia eremophila	Buttercup bush	Injune Creek	Common in brigalow-belar scrubs

Calciphile Vegetation—continued.

Botanical Name.	Vernacular.	Locality.	Remarks.
Dodonea triangularis ..	Hop bush	Dawson River ..	Common in sandalwood country
Dodonea viscosa	Hop bush	Widespread	Common in sandalwood country
Owenia audula	Emu apple	..	Common in brigalow-belar scrubs
Notelæa punctata	..	..	Common in brigalow-belar scrubs
Neterodendum oleœfolium	..	..	Common in brigalow-belar scrubs
Olearia stellulata	..	..	Common in brigalow-belar scrubs
Eremophila Mitchellii ..	Sandalwood	Widespread	More or less associated with belar and wilga
Geijera parviflora	Wilga	Widespread	With belar and sandalwood
Alstonia constricta ..	Peruvian bark ..	Kilmorey, Dividing Range	..
Canthium oleifolium ..	..	..	..
Notelæa microcarpa ..	..	..	..
Hovea longifolia	..	Injune Creek	..

VERY SANDY WALLCON COUNTRY. SILICIOUS BELTS AND BUNDAMBA SANDSTONES.

Calciphobe Plants.

Eucalyptus dealbata ..	Tumbledown gum ..	Cornwall and Orallo ..	..
E. tesselaris	Moreton Bay ash ..	Cornwall and Orallo ..	..
Angophora intermedia ..	Apple	Cornwall and Orallo ..	..
A. lanceolata	Rusty gum	Cornwall and Orallo ..	..
Acacia macradenia ..	Strangle wattle ..	Dividing Range and Dawson River	..
A. excelsa	Ironwood	Durham Downs ..	Eurombah Creek and Frankvale Creek
Hovea longipes	..	Widespread	..
Grevillea striata	Beefwood	Widespread	..
Petalostigma quadriloculare	Quinine	Widespread	..
Callitris glauca	Cypress pine	Widespread	..
Exocarpus cypressiformis ..	Cherry	Widespraed	..
Jacksonia scoparia	Dogwood	Widespread	..
Eucalyptus Siderophloia var. decorticans	Ironbark	Kilmorey	Confined to high rough sandstones
E. crebra	Narrow-leaf ironbark ..	Dawson River to Jack's Mountain	..
Citriobatus pauciflorus ..	Orange	Sandstone Hills ..	At Dawson River
Prostanthera ringens ..	..	Kilmorey	Rough sandstone
Bossiæ rhombifolia ..	..	Dawson River, &c. ..	Rough sandstone
Leucopogon biflorus ..	..	Dawson River, &c. ..	Rough sandstone
Acacia doraloxylon ..	Lancewood	Dawson River, &c. ..	Rough sandstone
A. Burrowi	Wattle	Dawson River, &c. ..	Rough sandstone
A. buxifolia	Wattle	Wallaroo Creek ..	Rough sandstone
Hovea longipes	..	Kilmorey	Rough sandstone
Acacia decora	Wattle	Kilmorey	Rough sandstone
A. decurrens, var. dealbata and var. mollens	..	Kilmorey	Detrital sands
A. podalyriæfolia	Silver wattle	Kilmorey	Detrital sands
Myoporium sp.	..	Westgrove	Sandstone
Casuarina inophloia ..	Stringybark oak ..	Dawson River ..	Rough sandstone
Lysicarpus termifolius ..	Stringybark mermate or Budgera	Dawson River ..	Rough sandstone
Xylomelum pyriforme ..	Pear	Dawson River ..	Rough sandstone
Invigofera australis ..	Poison bush	Dawson River ..	Rough sandstone
Thryptomene sp.	..	..	..
Cassinia lævis	Rosemary	Dawson River ..	Rough sandstone
Dodonea triangularis ..	Hop bush	Dawson River ..	Rough sandstone
Cassia Eremophila ..	Buttercup bush ..	Dawson River ..	Rough sandstone
Acacia Cunninghamii ..	Wattle	Baffle Creek	Rough sandstone

IN WET PLACE ON POOR SANDSTONE COUNTRY (MOSTLY ARENOPHILE).

Angophora intermedia ..	Apple	Dawson River and Baffle Creek	..
A. lanceolata	Sugar gum	Dawson River and Baffle Creek	..
Callistemon viminalis ..	Red bottle brush ..	Dawson River and Baffle Creek	..
Leptospermum flavescens ..	Tea tree	Dawson River and Baffle Creek	..
Melalenca lencodendron ..	Paper-barked or broad-leaved tea tree	Dawson River and Baffle Creek	..
Acacia Macradinia ..	Strangle wattle ..	Dawson River and Baffle Creek	..

NEAR JUNCTION OF IPSWICH AND BUNDAMBA SERIES, CARNARVON RANGE.

Botanical Name.	Vernacular.	Locality.	Remarks.
Eucalyptus maculata ..	Spotted Gum	Carnarvon Range ..	Sandy soil
E. acmenioides	Stringybark ..	Carnarvon Range ..	Sandy soil
Macrozamia sp.	Burrawang	..	..
E. hemiphloia	Gumtop box ..	Carnarvon Range ..	Sandy soil

PLANTS COLLECTED BY H. I. JENSEN NORTH OF THE MAIN DIVIDING RANGE (GEOLOGICALLY CLASSIFIED).

Calciphile Plants.

Botanical Name.	Vernacular.	Locality.	Remarks.
Cadillia pentastylis ..	Ooline	Taroom district ..	On calcereous Walloon
Acacia harpophylla ..	Brigalow	Taroom, Bedourie, Brown and Nogoa Valleys	On calcareous Walloon, Ipswich, and both Upper and Lower Bowen limestones
Alphistonia excelsa ..	Red ash	Broadmere, Glenhaughton Range	Volcanic soils
Owenia venosa	Crow's apple	Broadmere, Glenhaughton Range	Volcanic soils
Hoya australis	Snake vine	Broadmere, Glenhaughton Range	Volcanic soils

Also bauhinia, belar, and most of the calciphile plants mentioned for the Ipswich-Bundamba south of the Main Range.

Eucalyptus microthica ..	Coolibar	Nogoa and Brown River Tributaries	Mainly on alluvial soils
E. hemiphloia	Gumtop box	Nogoa and Brown River Tributaries	Mainly on basalt soils

REQUIRING GOOD, HEAVY LOAM.

Eucalyptus melanophloia ..	Silverleaf ironbark ..	Calcareous loams ..	Good drainage required
E. tereticornis	Red gum	Along River and Creek flats generally	All formations, but on alluviated ground
E. Cambageana	Molly box	Bedourie, Clematis Creek, Jack's Mountain, Walangara Creek, &c.	Ipswich formation calcareous sandstone
E. popellifolia	Poplar box	Bedourie, Clematis Creek, Jack's Mountain, Walangara Creek, &c.	Ipswich formation calcareous sandstone
Acacia podalyriæfolia ..	Silver wattle	Bedourie, Clematis Creek, Jack's Mountain, Walangara Creek, &c.	Ipswich formation calcareous sandstone
Tristania suaveolens ..	Swamp mahogony ..	Widespread; Springsure to Taroom	On moist heavy soils
Tristania conferta	Moreton Bay box ..	At intervals over same area	On dry but good loams

CALCIPHOBE SPECIES—ALL ON SANDSTONE COUNTRY.

*Acacia Bancrofti	Wattle	Widespread	Silicious sandstones of Bundamba age
A. neriifolia	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
*A. Cunninghamii	Wattle	Widespread	Silicious sandstones of Bundamba age
†A. polybotrya var. foliolosa	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
†A. flavescens	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
A. complanata	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
†A. argentea	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
†A. juncifolia	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
‡A. brevifolia	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
‡A. conferta	Wattle	Glenhaughton ..	Silicious sandstones of Bundamba age
A. podalyriæfolia	Wattle	Walangara Creek, Mount Hope	Mixed soils

* These species occur on Bundamba, Upper Bowen, Middle Bowen, and other silicious sandstones.
† Coastal pecies. ‡ Inland species.

CALCIPHOBE SPECIES—ALL ON SANDSTONE COUNTRY—*continued.*

Botanical Name.	Vernacular.	Locality.	Remarks.
A. salicina	Black wattle	Clematis Creek	Sandstone, U. Bowen
A. difficilis		Clematis Creek	Sandstone, U. Bowen
A. excelsa	Ironwood	Clematis Creek	Alluvial patches
A. doratoxylon	Lancewood	Clematis Creek	Dry hill slopes with shallow ferruginous soils
Casuarina torulosa	Oak	Glenhaughton	Sandy dry country
C. inophloia	Oak	Glenhaughton, Clematis Creek, Moolayamber, Dawson River	Very sandy dry country
Ricinocarpus Bowmanni		Glenhaughton	On dry sandy sandstone range country.
Grevillea juncifolia		Glenhaughton	On dry sandy sandstone range country
Pultenea ternata		Glenhaughton	On dry sandy sandstone range country
Hovea longifolia		Glenhaughton	On dry sandy sandstone range country
Boronia ledifolia		Glenhaughton	On dry sandy sandstone range country
Hakea plurinervia	Beefwood	Glenhaughton	On dry sandy sandstone range country
Petalostigma quadriloculare	Quinine	Glenhaughton	On dry sandy sandstone range country
Cœlospermum reticulatum		Clematis Creek	Upper Bowen sandstone
Heterodendron oleæfolium		Clematis Creek	
Eucalyptus decorticans	Ironbark	Clematis Creek, Glenhaughton, &c.	Dry sandstone mountains
E. Muelleriana			
E. maculata and E. var. Atriodora	Spotted gum	Meteor Creek and Clematis Creek	Ranges
E. crebra	Narrow leaf ironbark	Widespread	
E. melanophloia (narrow leaved variety)	Silverleaf ironbark	Widespread, but chiefly on better patches	
E. dealbata	Tumbledown gum	Glenhaughton, &c.	On poor sour country
E. tesselaris	Moreton Bay ash	Widespread	On deep sandy loams
E. acmenioides	Stringybark	Widespread	On dry sandy ridges
E. Watsoniana	Yellowjacket	Widespread	On deep sandy soils
E. terminalis	Bloodwood	Widespread	On sandstone alluvials
E. trachyphloia	Yellow-wood	Widespread	On dry but deep sandy soils
Angophora lanceolata	Sugar gum	Widespread	On deep sandy soils
A. intermedia	Apple	Widespread	On alluvial loams
E. rostrata	River red gum	Nogoa region	On fair loams
Lysicarpus termifolius	Budgeroo tree	Widespread	On dry sandy ridges and tablelands
Xylomelum pyriforme	Wooden pear	Widespread	With "boodgeroo"

Alluvials and deep detrital soils always have an abundance of apple (*Angophora intermedia*) and in the Nogoa and Brown River basins also cabbage gum (*Eucalyptus papuana*).

CONCLUSION.

The main utility of an investigation of this kind is, of course, in judging country by the timbers, and knowing what timbers to reafforest an area with from the nature of the soils. We will take a few instances to illustrate these points.

Take, first, the ironbarks. The narrowleaf (*E. crebra*) is so cosmopolitan in associations that it signifies little except dry, well-drained, and somewhat stony country. The silverleaf (*E. melanophloia*) must have calcareous and well-drained soil, good in plant food, and never waterlogged. It grows on the ridges with shallow but rich calcareous soil in the Stanthorpe district, in the Walloon belt north of Roma, and innumerable other places, but on Clematis Creek Gorge we find it along the watercourse in deep, alluvial loam. The lime attracts it here, and, though floods may sweep down the gorge, the run-off is so rapid that in a few days the soil is dry and sweet again. The mountain ironbark or gumtopped ironbark (*decorticans*) must have rocky, well-drained, and elevated sandy country to thrive. We only get it in the belts I have examined in such country. Here we get it associated with lancewood, budgeroo, &c., which have an affinity for similar country.

Take, now, lancewood (*Acacia doratoxylon*). This timber grows in similar situations to mountain ironbark, but chiefly where the sandstone is ferruginous. When the soil is pure silica sand we get with the ironbank (*decorticans*) budgeroo (*lysicarpus*) and stringybark (*E. acmenioides* with leaves like *Angophora intermedia*), and also the woolly oak (*Casuarina inophloia*).

In what has already been written, enough has been said to show what brigalow, belar, and poplar gum signify.

Sugargum (*Angophora lanceolata*) always seeks a deep, sandy loam—very poor in mineral plant food, but with high capillary power, but where such loams get richer in plant food we get Moreton Bay ash (*Eucalyptus tesselaris*) in similar looking soils. Both are associated with *Angophora intermedia* (apple), which is cosmopolitan to all loamy and sandy soils containing good water below, but in rich clay soils of alluvial origin it yields place to coolibar (*E. microtheca*). Tumbledown gum (*Eucalyptus dealbata*) grows in poor soils where the drainage is bad. Poplar box grows in rich soils where the drainage is inferior, but poplar box (*E. populifolia*) will also grow on higher country as long as it is a heavy and fairly good soil. With it the texture and chemical nature of the soil weighs more than drainage. The sandalwood (*Eremophila Mitchelli*) requires a soil good chemically, but impervious and inclined to be heavy and of great absorptive power for water, hence somewhat sour at intervals, but not necessarily alkaline, while brigalow seeks an alkaline soil.

Gumtop box (*E. hemiphloia*) usually means good soils inclined to be heavy loams and rich in plant food. It grows on basalt, limestone, and alluvial country, and requires good drainage; otherwise we get coolibar box instead.

These permutations and combinations can be considerably extended. It is a study which has both economic value and scientific interest to the natural historian. It is one in which geologists, botanists, forestry experts, surveyors, and agriculturists can collaborate and do good work.

SUDAN GRASS—A SORGHUM.

By F. F. COLEMAN, Expert under the Pure Seeds Acts.

About ninety years ago the then Sultan of Turkey was interested in the culture of cotton, and applied to the Governor of South Carolina for an instructor. Two or three years later the instructor returned to the United States of America and brought with him the seeds of a number of plants, among which was a kind of sorghum. An Alabama planter, Colonel Wm. Johnson, whilst on a visit to South Carolina, became interested in the new plant, and raised it extensively in the fertile lands of the Alabama River. Hence its name, Johnson Grass. Once established, it became almost impossible to kill it, because of its deep-running branching root stocks. But for the fact of its being a tropical plant, likely to be winter-killed where the ground freezes to any depth, it might have possessed the land to a greater extent.

When looking for an annual form of sorghum with the characteristics of Johnson, but without its persistent root stock, no better place for a search could be found than countries adjacent to the place from which Johnson was first obtained.

Recognising this fact, an organised search for forms lacking these root stocks was made by the United States of America Department of Agriculture, which in 1909 obtained from the Director of Agriculture at Khartoum a sorghum known to the natives as "Garawi." In order to give it distinctiveness, this was called "Sudan grass," by which name it is now popularly known.

Sudan grass has been described by Charles V. Piper, of the United States Department of Agriculture, as Andropogon Sorghum, var. *Sudanensis*, Johnson grass being known as *Andropogon halepensis*, and is distinguished from all other forms of cultivated sorghum by possessing underground root stocks, thus being truly perennial.

Recently a very thorough and scientific examination of tropical grasses was made at the Royal Botanic Gardens, Kew, London, and Mr. O. Stapf has revived the name of "sorghum" for this section of the *Andropogonæ*.

Sudan grass should therefore be known as *Sorghum Sudanense* Stapf.

Farmers would do well to realise that Sudan grass is a sorghum; the use of the botanic name *Sorghum Sudanense* will keep it before them, and may save considerable loss if the care required for sorghum is always used with Sudan.

The origin of the cultivated sorghums is a problem as yet undecided. The wild forms, however, are easily separated into two groups—namely, the perennials, with root stocks like Johnson, and the annuals, with fibrous roots only, such as Sudan and Tunis grass and kindred growths. The latter cross spontaneously with the cultivated sorghums, while the former are difficult to cross.

It is thus seen that Sudan grass (*Sorghum Sudanense*) is easily cross-fertilised by any of the cultivated sorghums, and when grown near any other variety a number of variants or rogues will appear. These rogues do no harm if the crop is for feed, but, in case of a crop intended for seed, the rogues must be pulled out. This should be done as soon as they can be distinguished, which would prevent further crossing

but cannot make the strain quite pure. Care should, therefore, be taken to sow seed from a true strain, and to go over the crop, pulling out all variants. Further, the seed must be grown in an isolated place, away from any other kind of sorghum.

On pages 7 and 8 of the "Queensland Agricultural Journal" for July, 1921, will be found an article on the poisonous glucosides sometimes found in sorghums. The article makes a special reference to both Sudan and Saccaline, and should be of more than passing interest to all farmers.

The different types of cultivated sorghums may be divided into three groups, based on the economic use of the crop: —

(*a*) Saccharine sorghums.
(*b*) Non-saccharine sorghums.
(*c*) Broom corns.

Saccharine sorghums are those with abundant sweet juice, cultivated at one time principally for syrup manufacture and now as a forage plant. This group is referred to in the United States of America as "sorgo." Non-saccharine sorghums contain a scant juice, slightly sweet to subacid, grown principally for grain, but also as a forage plant. Broom corns are non-saccharine, pith-dry, grown for the brush, and are not valuable as a forage plant.

The standard of purity and germination, prescribed by the Regulations under the Pure Seeds Act, for sorghums, is:—

Inert matter (chaff, dust, broken seed, and all matter other than seed)—2 per cent. by weight.

Seeds of weeds or seeds of any kind other than to which the sample purports to belong—1 per cent. by weight.

Dead and non-germinable seeds—25 per cent. by count.

In other words, the pure seeds contained in the sample must give a germination of 75 per cent., and the sample must not contain more than 2 per cent. of inert matter and 1 per cent. of foreign seeds.

The weed and other foreign seeds of most frequent occurrence in *Sorghum Sudanense* are:—

Datura stramonium (Thorn apple). All parts of this plant are poisonous, especially the seeds.

Xanthium spinosum (Bathurst burr).

Hibiscus trionum (Bladder ketmia).

Chenopodium sp. (Goosefoot or fat hen).

Panicum sanguinale (Queensland summer grass).

Sorghum vulgare (Sorghum).

Avena fatua (Wild oat).

Centaurea melitensis (A star thistle).

Bromus unioloides (Prairie grass).

Melilotus parviflora (Hexham scent).

Sida retusa (Sida weed).

Polygonum sp., Setaria sp., Apium sp.

In the course of the last two years, a large number of *Sorghum Sudanense* samples have been examined at the seed laboratory, with the following results:—

Sixty samples in every 100 examined grew 75 per cent. or better.

Twenty samples in every 100 examined on account of impurities or low germination were classed as B grade.

Twenty samples in every 100 examined did not comply with the regulations under the Pure Seeds Acts, on account of impurities or low germination.

When it is considered that the standard for B grade sorghums is only 60 per cent. germination of pure seeds, and the amount of weed or other foreign seeds allowed 2 per cent., with 3 per cent. of inert matter, the figures give cause for grave reflection.

The best of seed-cleaning machinery cannot remove all impurities, and the seriousness of such pests as *Datura Stramonium* should be combated by those at the seat of the trouble—the farm where the seed was grown.

The recent loss of cows in the Goombungee district again directs attention to the fact that sorghums are sometimes poisonous; every grower should therefore remember that Sudan grass is a sorghum.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1921.

There was a decrease in egg production during the month. This can be accounted for by the extremely adverse weather conditions, the weather during the month being excessively hot, the temperature for days at a stretch being in the vicinity of 100 deg. in shade, and one day registering 106 deg. The result was that four deaths occurred, and several birds had to be removed to hospital for treatment. Broodies were extremely troublesome, the following being the only breeders competing in the heavy section who had only one broody:—Walters, Shanks, Singer, and Morris. Not a single heavy pen was free, and in some cases every bird in the pen was at one time out in the broody coops, some of them even twice. Those who lost birds during the month with the heat were:—Stacey, O. Goos, Oakleigh Poultry Farm, J. W. Newton, and W. Barron. The following are the individual records:—

Competitors.	Breed.	Nov.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	151	1,054
*W. and G. W. Hindes	Do.	144	1,044
R. Gill	Do.	125	1,028
*Mrs. R. Hodge	Do.	153	1,004
*G. Trapp	Do.	127	982
*H. Fraser	Do.	146	976
*T. Fanning	Do.	158	961
F. Birchall	Do.	118	955
*H. C. Towers	Do.	121	950
H. C. Thomas	Do.	116	948
*C. M. Pickering	Do.	134	947
Oakleigh Poultry Farm	Do.	123	935
*W. Becker	Do.	132	909
R. C. Cole	Do.	113	905
W. A. Wilson	Do.	115	900
*C. Goos	Do.	137	894
*J. W. Newton	Do.	121	884
*Thos. Eyre	Do.	139	881
*R. C. J. Turner	Do.	139	879
Mrs. E. White	Do.	126	876
W. Barron	Do.	118	859
*Thos. Taylor	Do.	131	865
M. F. Newberry	Do.	127	863
Bathurst Poultry Farm	Do.	113	862
*S. L. Grenier	Do.	133	859
*E. A. Smith	Do.	138	851
*E. Chester	Do.	118	847
H. Stacey	Do.	89	846
*G. Williams	Do.	130	842
*Mrs. L. Anderson	Do.	135	839
*B. Chester	Do.	116	838
J. W. Short	Do.	130	836
O. C. Goos	Do.	108	806
*Haden Poultry Farm	Do.	129	804
Mrs. E. Z. Cutcliffe	Do.	105	796
*H. P. Clarke	Do.	131	783
E. Stephenson	Do.	83	773
*W. and G. W. Hindes	Brown Leghorns	105	767
Linquenda Poultry Farm	White Leghorns	97	748
W. M. Glover	Do.	106	733
Brampton Poultry Farm	Do.	118	717

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Nov.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	119	1,080
*R. Burns	Do.	124	1,018
*A. E. Walters	Do.	135	998
*T. Hindley	Do.	120	991
W. Becker	Langshans	127	988
Rev. A. McAllister	Black Orpingtons ...	93	975
*Jas. Ferguson	Chinese Langshans ...	98	973
*Parisian Poultry Farm	Black Orpingtons ...	111	956
*C. C. Dennis	Do.	123	943
Jas. Ryan	Rhode Island Reds ...	116	936
G. Muir	Black Orpingtons ...	105	933
*E. Morris	Do.	136	915
Jas. Potter	Do.	84	912
Jas. Every	Langshans	89	906
*E. F. Dennis	Black Orpingtons ...	105	894
*J. Cornwell	Do.	105	879
*N. A. Singer	Do.	124	848
*E. Stephenson	Do.	89	822
*R. Holmes	Do.	97	822
C. Cumming	Do.	119	810
*J. E. Smith	Do.	118	804
*A. Shanks	Do.	121	801
*Mrs. G. Kettle	Do.	96	784
*H. M. Chaille	Do.	95	779
J. W. Newton	Do.	94	772
*E. Oakes	Do.	113	750
F. Harrington	Rhode Island Reds ...	97	706
Tom C. Hart	Black Orpingtons ...	118	650
Total	...	8,172	60,691

* Indicates that the pen is being single tested.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	163	178	191	166	195	161	1,054
W. and G. W. Hindes (W.L.) ..	185	161	173	188	182	155	1,044
Mrs. R. Hodge	165	172	185	171	178	133	1,004
Geo. Trapp	168	153	164	160	174	163	982
H. Fraser	189	140	171	161	165	150	976
T. Fanning	176	152	172	149	153	159	961
H. C. Towers	167	145	165	127	160	186	950
C. M. Pickering	176	160	154	140	179	138	947
W. Becker	176	171	139	141	170	112	909
Chris. Goos	154	172	123	116	133	196	894
J. W. Newton	149	166	174	152	103	140	884
Thos. Eyre	154	145	108	158	163	153	881
R. C. J. Turner	152	139	141	134	155	158	879
Thos. Taylor	144	151	140	121	132	177	865
S. L. Grenier	148	167	116	145	145	138	859
E. A. Smith	174	144	151	139	135	108	851
E. Chester	157	144	131	139	136	140	847
G. Williams	192	152	114	122	134	128	842
Mrs L. Anderson	145	154	136	131	148	125	839
B. Chester	124	142	161	136	151	124	838
Haden Poultry Farm	92	127	147	147	139	152	804
H. P. Clarke	174	111	137	104	139	118	783
W. and G. W. Hindes (B.L.) ..	117	124	109	116	129	172	767

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	118	151	209	157	182	201	1,018
A. E. Walters	184	175	154	163	153	169	998
T. Hindley	174	173	176	134	164	170	991
J. Ferguson	158	144	145	186	164	176	973
Parisian Poultry Farm	164	154	158	206	116	158	956
C. C. Dennis	157	148	142	174	163	159	943
E. Morris	174	159	107	171	152	152	915
E. F. Dennis	136	163	143	147	141	164	894
J. Cornwell	141	136	147	164	138	153	879
N. A. Singer	147	130	139	142	121	169	848
E. Stephenson	160	132	139	143	107	141	822
R. Holmes	116	140	140	146	167	113	822
J. E. Smith	170	185	128	109	110	102	804
A. Shanks	108	131	131	145	134	152	801
Mrs. G. Kettle	132	153	170	85	112	132	784
H. C. Chaille	100	142	134	161	136	106	779
E. Oakes	108	135	129	157	108	113	750

CUTHBERT POTTS,
Principal.

JUDGE'S REPORT.

In reporting on the judging for "trueness to type," Mr. A. G. Harwood, College Poultry Instructor, writes:—

"It is pleasing to note that a big improvement in type and size of Leghorns has been made. It would appear as if the time had passed when the little squirrel-tailed bird held sway. There is hardly a specimen of this kind to be seen among the 246 competing Leghorns this year.

"On looking back over the past five years, in the course of which our 'true to type' conditions have been in force, and on comparing the type of birds in the current competition with that displayed in previous years, one feels highly gratified with the advance breeders have made, and this with no decrease in egg-production. When it was established that all birds entering for our competitions would be subjected to judgment for 'trueness to type,' we were often confronted with the remark that 'production was required, not feathers.' The steady improvement in type accomplished so far, coupled as it is with an equally high fecundity, would seem to take all sting out of this dictum.

"But there is another feature which is perhaps of even more importance than the retention of an exceedingly high fecundity. In our judgment for type, great stress is laid on stamina. Birds are subjected to egg-laying tests with the object of using them and others of the same breeding for stud purposes. With weak-constitutioned birds, incubation losses and hatching troubles are great. These can be minimised if stud birds are strong, healthy, and possess great stamina. Had our judgment for type accomplished nothing else but an improvement in this direction, it would have been justified, even had this improvement been accompanied by a slight diminution in egg-production.

"In regard to this, we would again remind breeders of the wisdom of carefully noting any sickness or trouble in each bird in the course of its rearing. However much the birds may appear to have recovered by the time they are selected for competition, it is almost certain that their previous ailments will tell against them in the strenuous effort of rapid egg-production. Again, it has to be remembered that the College competition is conducted under open weather conditions. Birds bred under confined, and frequently under super-refined, conditions have no opportunity to display many weaknesses in constitution and stamina which they may possess. These weaknesses, however, show up under the more open conditions obtaining in the competition.

"The Orpington still gives difficulty in classification, and, as previously, we have had to be lenient in our judgment. What is the most typical pen has proved to contain excellent producers, the six birds laying 882 2-oz. eggs in seven months. These birds possess almost perfect heads according to the Orpington standard. They are blocky and low set (but not to the extreme of the show bird), fairly good tails, and a moderate back. Their colour was excellent on arrival, and their uniformity is most striking. They have a moderate tightness in the feather. The majority of the birds, however, while uniform among themselves, vary much from the Orpington standard. They form a type of their own. This has been pointed out at our last two poultry conferences. Undoubtedly we should adopt a special standard for our laying Orpingtons. As relevant to this point, we quote from a report of the Hague Congress:—

"'Mr. Bogaert then spoke on the desirability of international standards being issued. He thought that the country of origin should issue the standard and other countries fall into line. He alluded to the Campine, which in English hands has become quite different to the Belgian fowl. He also spoke of the Leghorn, and pleaded for a universal type.

"'Mr. C. S. Van Gink considered that Mr. Bogaert was too sweeping. Such drastic changes would only be effected gradually, and the matter should be discussed at the next congress. Mr. Van Gink remarked that some countries had apparently misunderstood the schedule of the exhibition, and thought that they could only send birds of their own country. This was not so, as they had hoped that any variety would be sent from any country.

"'Mr. Edward Brown then spoke on the international standard, and said in his opinion it would be a blunder to insist on such a thing, as the characteristics of a breed were altered by many facts, such as feeding, climate, soil, &c. The countries of Western Europe have paid much attention to breeding, while other countries have not. He exampled the Leghorn, originated in Italy, and the Minorca in Spain, both of which had been improved by breeders in other countries. Had an international standard been insisted upon, the exhibition would have suffered considerably, as English Houdans could not have been shown, being very different from the French, and the English Brahma differed widely from its oriental stock. He suggested that the subject should be discussed by a committee as of much importance. Mr. Voitellier agreed with Mr. Brown, and thought an international standard undesirable.

"'An Italian speaker thought that every country should have a standard for each variety. Unfortunately in Italy they had none, not even for Leghorns, but they hoped it might be remedied shortly.'

"Action has already been taken in this direction in England. Birds sent over from Australia were not recognised as Orpingtons. Instead, they were given the name of 'Australorps,' and a club has been formed to foster the breed. Is it not Australia's duty now to decide upon a standard, adopt the name given by the English breeders, and so save the confusion existing in respect to two distinct and different types? In the current competition at Gatton there are a large number of fine, big, strong blacks of a distinct type. That they have stamina and can produce eggs cannot be denied, but their length of back, length of shank, cut-away front, and long tail in no way compares with the requirements of the Orpington standard. They are absolutely a type of their own. Type makes the breed and colour the variety, and 'Black Australorps' should be their name henceforward."

Details of competing pens are subjoined:—

TRUENESS TO TYPE.

Name.	Class.	Remarks.
S. L. Grenier	1	Good size; typical; good doers.
W. and G. W. Hindes (W.L.)	2	On small side; never still in their pens.
Mrs. L. F. Anderson	1	Uniform and of good type.
Geo. Williams	3	"F" and "D" feathers on shank; variation in outline; splendid doers.
Mrs. R. Hodge	1	The best pen of Leghorns in the test; clean faces, plenty of size, and every bit Leghorns.
J. M. Manson	2	Not too uniform, but hard, tough workers.
W. Becker	1	Just managed this class, their stamina availing them.
Chris. Goos	2	Type variable; "D" and "E" amongst the best birds in the test.
J. W. Newton	2	Headpieces not too uniform; indifferent feeders at times.
T. Taylor	4	"D" very fair; the others too small.

Name.	Class.	Remarks.
Haden Poultry Farm ..	2	Variable; poor feeders.
H. P. Clarke	1	An excellent pen throughout.
Thos. Eyre	1	Could be more uniform; show good stamina.
Harold Fraser ..	2	"B" spoils an otherwise first-class pen; she is on the small side, and possesses an upright comb. "A" is very typical.
Geo. Trapp	1	Very uniform; good length; deep behind.
T. Fanning	1	Typical; hard, good doers.
R. C. J. Turner ..	1	Could do with more width; good length, and uniform.
W. and W. G. Hindes ..	1	Brown Leghorns as big as any Whites; very uniform and typical.
E. Chester	2	Inclined to be easy, indifferent feeders at times.
B. Chester	2	Type variable; excellent doers.
E. A. Smith	1	Good size; long bodies; a nice pen.
C. Pickering	1	"D" rather small; a good pen all round.
W. M. Glover ..	1	A fine, big, typical pen.
H. Stacey	2	Poor feeders; uniform; medium size.
O. Goos	1	One of the best light pens for size and outline.
R. Gill	2	On small side, possess stamina, and are uniform.
Oakleigh Poultry Farm ..	2	Variable type; rather narrow; great headpieces; excellent feeders.
E. Stephenson	2	Variable type; two inclined to be dwarf.
R. Cole	1	Uniform; hard; good doers.
Mrs. E. White ..	2	Narrow; variable tail carriage; nice headpieces.
W. Wilson	2	Side spikes in evidence; one dwarf.
H. C. Thomas ..	2	Type mixed.
Mrs. E. Z. Cutcliffe ..	2	Inclined to be leggy.
J. W. Short	3	Two very small; size generally uneven.
Linquenda Poultry Farm ..	2	Very poor feeders; could do with more substance.
F. Birchall	1	Good all-round pen; very nice headpieces.
Brampton Poultry Farm ..	2	Variations in type and headpieces.
Bathurst Poultry Farm ..	1	Even in type and size; a nice pen.
F. M. Newberry ..	1	Another even pen; excellent doers.
J. Barron	1	Excellent bodies and very uniform; amongst the best.
W. Becker	1	Good heads and legs; uniform.
J. Ryan	4	Small size; fine bone; no colour or type.
Tom Hart	2	Side spikes in evidence; the usual class of laying Orpington.
Rev. A. McAllister ..	1	The most typical in the test; uniform; excellent headpieces.
J. Harrington ..	1	Plenty of size; good type; colour good on entry.
J. Potter	2	Side spikes in evidence; taily; rather fine in bone; grand eyes.
G. Cumming	2	Variable in type.
G. Muir	1	Not the largest; uniform in type; rather shorter in leg than the majority.
T. Fanning (B.O.) ..	2	Side spikes on one; type variable. This pen contains four birds of the Australorp type.
J. Newton (B.O.) ..	2	On small side; lower than the majority.
Jas. Every	2	Side spikes on one; rather small; pale eyes in evidence.
T. Hindley	1	Good eyes; uniform size; good doers; Australorp type.
R. Burns	2	Variations "A" and "E"; light eyes; "D" and "F" more after the Orpington type; "A" large, resembling laying type.
E. F. Dennis	2	Good eyes and tails; indifferent heads; Australorp type.
A. E. Walters ..	1	Good bright eyes; uniform type; taily; Australorp type.
Geo. Kettle	3	Feathers on shanks; side spikes; "C" nearest an Orpington.
Parisian Poultry Farm ..	1	Grand heads and uniform; great workers; the Australorp type.
J. Ferguson	1	Moderate size; uniform; incessant workers.
R. Holmes .. .	1	Good heads; Australorp type.

Name.	Class.	Remarks.
A. Shanks	1	Uniform; Australorp type.
J. E. Smith	2	Variations in type; "F" hen Australorp type.
E. Stephenson	2	Good eyes; variable type.
N. A. Singer	1	Plenty of size and bone; Australorp type.
E. Morris	3	"A" and "F" side spikes; variations in type, "A" and "C" as near the Orpington standard as any in the test.
N. Chaille	1	Excellent eyes; blocky and uniform.
E. Oakes	1	Good heads; blocky; lower than usual.
C. C. Dennis	1	Good eyes; uniform; Australorp type.
J. Cornwell	1	The Australorp type again.

THE FOWL TICK.*

By J. BEARD, Poultry Instructor.

Fowls that have been infested by ticks and recover become immune from further attack. This explains the reason why sometimes flocks of fowl are apparently in the best of health and condition, yet, if examined, they will be found to be covered with the larval ticks, and the houses may be found swarming with the pest.

Symptoms.—If clean fowls are put into these yards they will at once become affected and, in three or four days, the result of tick worry and inoculation by the pest, fever will be at its height. The fowls will appear drooping and listless, the combs becoming quite pale; they then lose the use of their legs. Severe diarrhœa sets in, death resulting in a few hours. The better condition the clean birds are in the quicker the poison will act. The fowl ticks themselves are infested with a parasite which they pass into the blood of the fowl, where it becomes a blood parasite, and the micro-organisms multiply with such marvellous rapidity that, in most cases, the fever causes the death of the birds. Every bird, in turn, becomes a centre of infection for healthy ticks that suck its blood, thus becoming in turn infected, and transmitting the blood parasites into a fresh victim. This disease is known as Spirochætosis in fowls and is caused by a blood parasite. This tiny organism is conveyed from ticks to healthy fowls through the bite of the commonly known poultry tick (*Argus persicus*), its incubation period ranging from three to nine days.

The ticks are capable of transmitting the disease to healthy birds five months after feeding upon the blood of (*Sphiro-chacta*) infested fowls.

All poultry, fowls, ducks, geese, and turkeys are subject to the disease, but the losses are always greater amongst the first mentioned. This may be accounted for by the fact that the latter are more restless in their habits, therefore the "seed" ticks have not such opportunities of attaching themselves to these birds.

Remedy and Prevention.—Once the ticks have firmly established themselves in the fowlhouse, it is almost impossible to eradicate them. Therefore the houses and fences should be burnt, likewise any trees that may have been in the pens, and the ground thoroughly disinfected with some strong solution. From experience the following have been found very effective remedies:—Pure kerosene, crude petroleum, creosote, or some of the standard dips, used at a strength of one part of the dip to three parts of water.

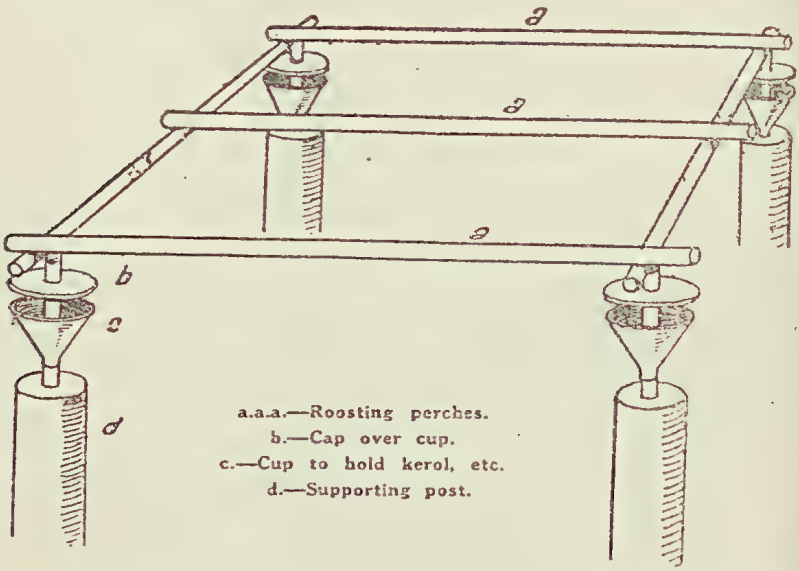
The new houses should be of iron, with as little woodwork as possible. The perches, which should be tick proof, can be procured at almost any ironmongery or poultry supply store. A good plan for a perch is to put two supports of sawn timber into the ground. Drive a nail into each at the top; bore a hole in each end of the perch so that the nail will just go through, and then lay the perch in the supports. This will keep it in position, and the perch can be lifted up to see if any ticks are underneath. Tie a piece of flannel round each support of the perch about half way up and, if there are any ticks about, you will in time catch them all, as after feeding on the fowls they will start for their hiding-place but, being full and lazy, will take the first shelter offering; thus you will find them under the perches or under the flannel. The latter can be removed and be burned along with the ticks that hide in it, and be replaced with fresh clean flannel.

Another method of tick eradication is described and illustrated by "W.R.M." (Sellheim, Q.), who writes in the current "Poultry" (19th November, 1921) as follows:—

"When I first arrived here I found the fowlhouse swarming with ticks, although no fowls had occupied it for four months. I pulled it down and passed all the

* This is a revision of an article that appeared in the "Queensland Agricultural Journal" for August, 1917, *op. cit.*, vol. viii., N.S., pp. 67-99.—Ed.

iron through fires of packing material, then burnt the wood. Then rebuilt and got no fowls for three months, first swinging the perches from the roof, with inverted bottles—full of kerol—on the supporting wires from the roof; this was not stable enough, so I hit on a better plan. Taking some half-inch piping cut into two-foot lengths, I soldered on narrow cups—to hold kerol or sheep dip—about 6 in. from one end. I then sunk blocks of wood into the ground, having bored holes into each block to take a piece of pipe. I used round saplings for perches, with a hole bored in both ends for the purpose of bolting the perches to the supporting pipes. It is nearly two years since I did this, and my fowls have not suffered from a visitation of the tick since."



Every care should be exercised to ascertain that all birds coming into the yard are clean and free from diseases and pests. If there is the slightest doubt, the birds should be placed in strict quarantine for nine days and the coops in which they have been kept thoroughly inspected. If young ticks are discovered clinging to the bodies of the fowls, the birds should be dipped in a strong solution of phenol or Cooper's sheep dip, which will kill the pests. After the birds have been dipped in the solution they should be given a teaspoonful of port wine every few hours, and kept in a dry, warm place.

If the fowlhouses are not badly infected the tick can be eradicated by thoroughly spraying with some of the solutions previously mentioned.

On account of its cheapness and the fact that it is so easily prepared, the following is recommended:—Boiling hot soapsuds, to which add ½ oz. crude carbolic to the bucketful. The action of this solution is sure, and if properly applied it will penetrate into the smallest cracks and crevices, which a thicker solution would not reach.

Hot coal tar is also a good thing to use on fences and buildings, but care must be taken that it gets into all the cracks.

If whitewash is used, care must be taken that it is not applied too thick, because as the wash dries a space is left between it and the wood, which makes a good harbour for the pests.

There is yet another method which I have found to be very effective, and that is the use of a blow lamp (such as painters use). The heat and flame from this lamp will penetrate into the smallest cracks and kill all pests that may be concealed therein.

If the poultry-keeper will follow out these simple instructions, his yard should soon become free from the pest, and if it does not remain so he will only have himself to blame for lack of the precautionary measures suggested in regard to the introduction of fresh birds, coops, &c., or non-observance of those warnings contained therein.

CERTIFICATES OF SOUNDNESS.

November list of Stallions registered and certified as sound.

Name of Stallion.	Owner.	Address.
	BLOOD STALLION.	
Flirtside	H. F. Hassell	Eumundi

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

TABEBUIA ROSEA.

NATURAL ORDER BIGNONIACEÆ (Trumpet Flower Family).

BY E. W. BICK, Curator.

Derivation.—*Tabebuia,* said to be the native name in Brazil (Nicholson, "Dictionary of Gardening," Vol 4, p. 1); *rosea,* referring to the colour of the flowers.

Description.—Tabebuia, a genus embracing about sixty species of glabrous, pubescent or villous, erect trees or shrubs, natives of tropical America. They require similar treatment to that for tecomas, under which these plants are sometimes included.

Tabebuia rosea (D.C. Prodr., Vol. IX., p. 215—1855). Leaves made up of five leaflets borne on a fine stem (petiole) leaflets smooth, longish oval, sharpened point, blunt at base, centre one about 6 in., upper pair 5 in., and lower pair 3 in. in length, mid-rib very prominent at back of leaflet, lateral veins alternate, the whole bright green above, and lighter in colour beneath. Flowers numerous, borne in dense clusters at tips of small branches, in similar manner to those of the jacaranda and tecoma stans, to both of which it is closely allied. Calyx campanulate, two lipped, about ½ in. in length, corolla tube abbreviated, pale yellow at throat when newly opened, fading to white when older, lobes five, ample, prolonged cover, recurved of a bright rosy pink, stamens four, in two pairs, from ½ to ¾ in., style slightly longer, the whole flower being from 2 to 2¼ in. in diameter.

Habitat.—Mexico; also Guatemala. Described as *Tecoma rosea* by Bertol, "Flora Guatemala," p. 25.

In the Brisbane Botanic Gardens there is a tree, planted in 1903, of from 16 to 18 ft. high, near the kiosk; it is of erect growth, with light-brownish coloured smooth bark. The branches are of too upright a nature to make a good spreading head. The wood appears to be brittle. The tree flowers in November and December. Shortly before this, all the leaves from the top of the tree fall off and the flowers appear on the bare twigs; the dense clusters of rosy pink flowers have a fine appearance, and a large tree in full bloom would have somewhat the appearance of a large-flowered pink jacaranda.

Propagation.—From seed. Unfortunately this tree has not yet borne seed, but as the plants of this order are usually free in producing seed, probably it will, when older, seed freely.

GARDEN NOTES.

BY E. W. BICK, Curator Botanic Gardens.

January being one of the hottest months of the year, special attention must be paid to watering. In the evening or at night is the best time. Dahlias and chrysanthemums must be kept well supplied. Thin out a lot of the superfluous growth from the centre of your dahlia plants, if they are inclined to make a lot of growth, and better flowers will result. Keep the flowers cut, and take off all the spent blooms; don't allow them to seed, and the flowering season will be prolonged. These fine flowers should be a feature in every garden for the summer and early autumn months.

Prepare seed beds or boxes for an early sowing of winter annuals, and towards the end of the month plant a small sowing of cineraria, primula, stocks, petunias, dianthus, gerbera, ranunculus, and anemone. These latter two are well worth growing in any garden. The great variety of beautiful colours, and their long stems and fine keeping qualities when cut, make them great favourites. A trouble that occurs at this time of year is that heavy rains often come along when the seed has just been sown, or when the young seedlings are in their first growth, and they are battered down and killed. If provision can be made for cover with hessian or calico that can readily be put on or off, so much the better. Should the first lot be lost, put in another straightaway.

Now is a good time for croton and coleus cuttings. Put nice, strong cuttings of the former in, and your young plants will be good, strong ones for a start. The cuttings do best in about half sand, with a little fine charcoal, cocoanut fibre dust, and a good light loam. Place them around the edges of 5 in. or 6 in. pots, and plunge them in the ground in a well-drained, sheltered position, or in a shaded frame, if available. Although the croton likes plenty of water, it does not like a sour, wet place. A few crotons planted out make a good show and are useful for cutting when flowers are scarce; they revel in a warm, sunny, well-drained position, a free soil, and should be sheltered from strong winds.

If there is any lawn work to be done, get it in hand as soon as possible. Cut out all *Paspalum dilatatum*, *Elusine indica* (Crow's foot), *Sporobulus indicus* ("rat's tail"); fill up holes, and give a light top-dressing all over. Keep it well watered and roll occasionally, and your grass will soon improve.

Any plants of trees, shrubs, or palms planted out of pots will require shading and careful attention in watering for a few weeks, until they get a hold of the soil.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR NOVEMBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Thyra of Myrtleview	Ayrshire ...	31 July, 1921	1,382	3·8	58·48	
College Mignon ...	Jersey ...	7 July ,,	778	5·1	46·42	
Iron Plate	,, ...	12 July ,,	964	4.2	45·82	
Hedges Madge ...	Holstein ...	15 Aug. ,,	1,037	3·8	43·89	
Prim	,, ...	9 Mar. ,,	1,168	3·4	43·03	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	785	4·8	42·51	
Miss Security ...	Ayrshire ...	20 Aug. ,,	1,138	3·3	41·56	
College Evening Glow	Jersey ...	10 Oct. ,,	833	4·3	39·99	
Bellona	Ayrshire ...	26 June ,,	933	3·8	39·38	
Auntie's Lass ...	,, ...	31 Oct. ,,	925	3·3	33·77	
College Bluebell ...	Jersey ...	22 Oct. ,,	607	4·6	31·05	
Miss Betty ...	,, ...	7 July ,,	648	4·2	30·58	
Buttercup	Shorthorn...	28 Oct. ,,	906	2·7	28·62	
Yarraview Snowdrop	Guernsey ...	14 Oct. ,,	639	4·0	28 60	
Glow VI.	,, ...	28 Aug. ,,	658	3·7	27·17	
College St. Margaret	Jersey ...	25 Sept. ,,	802	3·0	26·41	
College Cobalt ...	,, ...	6 Jan. ,,	421	5·1	25·22	
College Cold Iron	,, ...	10 Mar. ,,	494	4·3	24·11	
Miss Fearless ...	Ayrshire ...	26 May ,,	512	4·0	22·45	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	389	4·8	21·52	
College Grandeur	,, ...	29 Dec. ,,	350	5·2	21·59	
Netherton Belle ...	Ayrshire ...	30 Nov. ,,	442	4·3	21·21	
Magnet's Leda ...	Jersey ...	6 Oct. ,,	357	5·0	20·88	
Hedges Nattie ..	Holstein ...	26 Feb., 1921	472	3·9	20·50	
Hedges Dutchmaid	,, ...	26 May ,,	450	4·0	20·11	

SUGAR: FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (2nd December, 1921) as follows:—

"In the course of the month of November the districts of Bundaberg, Avondale, Miara, Bingera, South Kolan, Bucca, and Gin Gin were visited. Included in the first-named area are the sub-districts of Woongarra, Fairymead, Barolin, and Gooburrum.

"*Woongarra.*—On the Woongarra area harvesting operations have finished. The cane has cut satisfactorily for the majority of the growers, who are now busy ratooning and cultivating the young plant crop. Dry weather is slightly checking the cane, but should rain occur before Christmas there is no danger of a serious setback.

"Generally speaking, agricultural operations connected with sugar-cane culture on the Woongarra have reached a higher standard than has been the case for some time. This is due to the fact that after the drought period that followed 1918, and the consequent deterioration of the crops, the farmers realised the necessity for thoroughly cleaning up their ground for the 1920 planting. This meant that the great bulk of the area was ploughed and cleared of old stools, and fresh cane planted, more care being taken in plant selection than is usually the case. There is yet, however, need for more crop rotation and vegetable manuring in these volcanic soils if canegrowing is to be successfully maintained until irrigation is accomplished. On some Woongarra farms cane has been grown continuously for forty years without a break or crop rotation of any kind, and therefore it is not surprising that these farmers get poor tonnages, even in wet seasons.

"Q.813 is doing well, the young plant cane of this variety looking very vigorous and promising a heavy tonnage for next year.

"Shahjahanpur is also making a good showing, Fairymead having planted about 40 acres at Spring Hill plantation. It is not altogether advisable, as yet, to plant too much of this variety until it shows a tendency to thicken, and the trash to become less adhesive. This may come about by careful farming and the cane adapting itself climatically.

"Other varieties making a good showing are 1900 Seedling and Badila, the latter principally on Qunaba plantation. D.1135 is still considerably grown, but the necessity for changing this cane has arisen, and growers would be well advised to try such varieties as Q.813, Q.855, Q.285, Q.907, or M.1900 Seedling, wherever possible, in its stead. D.1135 is showing 'striped leaf' and 'gumming' in a widely distributed manner.

"In the Woongarra district certain standard chemical fertilisers are in use, but most of the farmers are doubtful whether they are obtaining positive results. The best plan for the growers to adopt with regard to the use of fertilisers is to go to the Sugar Experiment Station and study experiments that have been carried out on typical soils and take advantage of analyses performed.

"*Barolin.*—On the Barolin side the cane is a little better, if anything, than on the Woongarra area. This is probably due to the fact that the farms here have been favoured with scattered thunderstorms. The variety M.1900 Seedling is making a particularly good showing, especially down towards the Elliot Heads, where this cane is principally grown. Other varieties are making average growth, while the c.c.s. values obtained were uniformly good. The grub pest is in evidence in the Barolin areas, and farmers who are in the track of prevailing winds should, as a preventive measure, endeavour to remove as many of the feed trees as possible. Carbon bisulphide as a repellant would probably be useful. There is not, however, a sufficiently heavy infestation to cause alarm.

"The majority of farms are in good condition, the farmers recognising the value of a good tilth as a moisture-conserving measure.

"It is worth noting that while some farmers pay particular attention to their cane, they allow badly kept patches of sorghum and cowcane to abound near their fields. These grains, in many instances, serve as hosts for parasites, either insect or bacterial, and should be kept away from sugar-cane.

"As mentioned several times in previous reports, the use of lime and green manures is recommended. Lime would probably increase the potash value of the soil, and green manures would give it badly wanted humus.

"The cane variety showing the greatest hardihood in the district is Yuban. It is a greedy feeder, with an immense top, but really should be discarded for reasons set out in previous reports.

"Black Innis is showing promise at Gooburrum, and there are also some good strikes of D.1135. There is less disease showing here than at other places visited round Bundaberg, and insect parasites are negligible this year.

"The question of chemical fertilisation should be closely gone into here, and small plots established to try manures under local conditions.

"I was afforded every facility for looking over Fairymead plantation. Fertilisation is being carried out on a liberal scale this year, and, generally speaking, the cultivation is good. The management has planted a big acreage of Black Innis, and has, as well, considerable areas of D.1135, Yuban, Q.813, Shahjahanpur, and a number of other varieties well known in the Bundaberg district.

"*Avondale.*—Canegrowing at Avondale is making favourable headway, the growers interesting themselves considerably in modern agricultural methods. At Avondale plantation, the Manager (Mr. Leaper) is doing good work. A block of plant Q.813 and D.1135 Sport is the best plant crop I have seen for some time. It would be a valuable assistance to the farming community if any growers with quantities of the former variety would allow farmers to purchase a portion for plants next year, if possible. Owing to careful selection of plants, disease at Avondale has dropped to a minimum. This especially applies to 'striped leaf' disease. The usual borer infestation appears to be minimised this year. Small losses are occurring through the depredations of the indigenous cane rat.

"*Miara.*—Down the river at Miara the farmers are busy cultivating and planting. Their crop returns this year have been good, both in tonnage and density. B.208 gave the best returns, although this variety is showing in places secondary symptoms of 'striped leaf' disease. There is great need, therefore, to be careful in planting this cane.

"Other profitable varieties are N.G.40, D.156, D.1135, H.Q.426, and Green Goru. Of these canes, N.G.40 gave the highest average c.c.s. values.

"Green manures would greatly benefit the farms back from the river, as they are deficient in humus. Miara is a good canegrowing area, although small, and energetic farmers should do well. Transport is the principal drawback.

"*Bingera.*—Bingera and South Kolan districts have sent more than their average amount of cane to the mill this year. Bingera plantation had a big crop, and the management expects to be crushing until some time in January. High densities are being obtained, especially from the 1900 Seedling, which in some cases is going over 17 per cent. of c.c.s. Other canes doing well are D. 156, B. 156, Q. 813, N.G. 16, and D. 1135. Good strikes are effected by soaking the plants in a solution of lime. The cane and ratoons look promising, chemical fertilisers having been used in many instances. These are mainly of the standard type, calculated to supply nitrogen, potash, and phosphoric acid in a concentrated form. The management attributes its success this year to deep and thorough cultivation, familiarity with the local soil conditions as a basis for chemical fertilisation, keeping the soil from becoming deficient in humus, careful selection of plants and changing, careful survey of cane, destruction of diseased plants, and irrigation.

"At South Kolan the farmers have some very fine crops of young plant cane and ratoons. They are keeping the land free of noxious weeds, and there is little evidence of insect parasites. The cane giving the best returns, however—1900 Seedling—is not ratooning as well as it might, owing to the presence of a disease in the stools. Other cane varieties which look well are Cheribon, Brisbane Seedling, D. 1135, and N.G. 16.

"*Bucca.*—At Bucca the farmers' prospects look better than has been the case for years. The roads have improved, although they are still pretty bad, and the organisation of the industry as far as transport to the mill is concerned has much improved. The farmers are still cutting, and the ratoon cane is coming along nicely, especially the young plant crop. The fields are well cultivated and free from weeds, and although a slight borer infestation appears at intervals, natural enemies are a controlling factor. An occasional grower is having some difficulty with his cane, in cultivating, owing to the rocky nature of the ground.

"Cane varieties recently obtained from the Sugar Experiment Station are Q. 813, Shahjahanpur, E.K. 1, and Q. 1098. Of these, the two lastnamed are making a good showing. Q. 813 is backward, but strong. Shahjahanpur is stooling heavily, as usual, but thin.

"*Gin Gin.*—At Gin Gin the canegrowers want rain. The ground is getting dry, although it still contains enough moisture to sustain the cane for some time yet. The farmers have had a good crushing this year, the cane being of good sugar content and cut with a minimum of industrial friction. The cane is ratooning well, and the

young plant crop is looking vigorous. Most of the growers are hard at work, and well-kept holdings are to be seen everywhere. Very little disease is showing, and the farmers have what might be termed a 'flying start' for next season.

"A visit was paid to that productive and well-situated belt of farm land on the river above Wallaville mill. This area should be ideal for irrigation if the farmers concerned could combine and make it an accomplished fact.

"*Maroondan.*—Farmers are still cutting. They have had heavy crops and high densities this year, and the cane is again growing strongly, although slightly affected by dry weather.

"Messrs. Sondergeld Bros. have an outstanding crop of plant cane (M. 1900), the result being achieved by constant and thorough cultivation and green manuring.

"There is no doubt about the tremendous improvement in texture given to these soils by green manures. Farmers' tonnages would be heightened if they could carry this out on a more extensive scale.

"Regarding varieties at Maroondan, the best plant crops appear to be 1900 Seedling, Q. 813, and D. 1135.

"I would advise the growers to increase their acreages of Q. 813.

"Summarising, the following principles could be more closely applied by numbers of growers in the different districts:—

More careful selection of plants;
Changing from dark soils to red soils, and *vice versâ;*
Thorough cultivation, especially in dry weather;
Deep ploughing;
Green manuring;
Liming;
Careful consideration and experiment before applying chemical fertilisers;
Destruction of old stool suspected of containing disease; and
Use of animal manure wherever possible."

The Northern Field Assistant, Mr. E. H. Osborn, reports (13th December, 1921) as follows:—

"*Mossman District.*—Early in November this area was visited. The mill had just finished a most successful crushing season, covering a period of seventeen weeks and accounting for a total of 62,165 tons of cane. The run was a very good one from every point of view, the cane being cut at very reasonable rates, and the constant supply of same was easily a record for the mill. Extraction was also good, and, in fact, everything worked in a very satisfactory manner, especially as no labour troubles of any kind, either in mill or field, caused friction or delay. Existing relations between the employers and employees in the district seem excellent.

"The approximate average density of the principal canes are as follows:—

Badila	13.61 c.c.s.
24 B (Green Goru)	13.04 c.c.s.
H.Q. 426	13.56 c.c.s.
D. 1135	12.64 c.c.s.
B. 147	12.51 c.c.s.

"The acreage cut was 3,804, giving an average per acre of 16.3 tons.

"For 1922 same 4,380 acres will be under crop, or an increase of 576 acres, and, as the cane has mostly got away well and is getting plenty of work put into it plus a fair quantity of manure, the tonnage figures for 1922 should show a decided increase on this year's output.

"Rat-poisoning with arsenic was also being carried out intensively by the company's officials, and, in connection with this, Mr. Muntz (Chairman of Directors of the mill) tells me that far better results are obtained with this poison than with strychnine. In a number of places I noticed that greyback beetles were coming out very freely, and in Cassowary and Saltwater some small plots of plant cane were said to be suffering from the effects of wire worms. Unfortunately, I could not obtain specimens of the latter, but, from observations elsewhere, the one said to be doing the damage at Mossman is somewhat different. In most places the young cane looks well, and ratoons are also coming away vigorously.

"On Mr. Crees's farm varieties were cut as a plant crop of 16-months-old, and, whilst the Badila and Hybrid No. 1 only gave a c.c.s. of slightly over 11 per cent., the Q. 903 was just 15 c.c.s.

"Manuring was being carried out generally as a regular thing, and I am informed by the mill authorities that the quantity of manure ordered this year is in excess of any other previous order. The following figures are of interest as showing the quantity and nature of the manures being used:—

Meatworks	350 tons
Sulphate of ammonia	200 tons
Basic super	150 tons
Shirley's 3.7	130 tons
	830 tons

"As mentioned in my previous report, the need of lime seems to be very apparent.

"At Mr. J. Robins's limestone show at the 7-Mile, the outcrop seems very large, runs roughly north and south, and is said to be of excellent quality, analysing from 95 to 98 per cent. of lime. It is situated upon a fairly steep ridge overlooking the Mossman Mill permanent line, and within about half a mile of the rails.

"*Freshwater.*—The conditions were seen to be very healthy, and all the cane has made splendid growth. Some very heavy work has been done in this locality since February last. On the Caravonica Estate 292 acres of land have been grubbed of lantana, burnt off, ploughed, and planted. Some plant cane upon this holding cut 45 tons to the acre, first ratoons 32 tons, and second ratoons 25 tons, quite recently, the cutters on the plant cane averaging 8 tons per man per day.

"Near Redlynch station some fine cane is also to be seen. It is mostly very clean, and looks remarkably well. At the time of my visit Mr. Surveyor Rutherford was engaged by the Colonial Sugar Refining Company in laying out horse-tram lines and permanent engine lines to harvest next year's crop from this locality. The scheme is a big one, and comprises about 2 miles of permanent engine line from the present terminus of the Colonial Sugar Refining Company's line to Edge Hill, whilst some 3½ miles of horse tram line and a bridge are to be built over the Barron from Redlynch station roughly in the direction of Caravonica. A further mile of the same sort of line is to go from Redlynch to adjacent country, whilst yet another mile of similar material goes from Jungara railway station to serve nearby plantations. All this cane coming over the horse tram line to Redlynch will be derricked and loaded at Redlynch for transportation per the Government railway to Hambledon. The cane cut on properties adjacent to the permanent engine line at Edge Hill, will, of course, go direct to the mill. The completion of these lines means a very busy time for the Freshwater district in the near future.

"*Cairns.*—Some very good cane was observed. At Mr. H. C. Draper's Farm, Waree, the plant and also the recently-cut cane look very well. Mr. Draper uses green manure and limes, also subsoils, and the results of his lately-cut crops certainly prove his wisdom in doing so. He also uses mixed manures with the following results:—Plant cane, 45 tons to the acre—First ratoons, 32 tons; second ratoons, 30 tons; and some third ratoons are now cutting about 25 tons per acre. These figures speak for themselves."

THE COTTON INDUSTRY IN QUEENSLAND.

By Major A. J. BOYD.

Although cotton has been grown for many years in this State, and, during the Civil War in America, to great advantage both to growers and purchasers of the crops, there are still people who make it their business to try to impress agriculturists with the idea that they themselves, although they have never been engaged in agriculture in any form beyond the cultivation of maize and potatoes, hold as to the profits to be derived from the land devoted to some semi-tropical crop, and they emphasise the statement that it is impossible to make money out of cotton owing to the want of cheap coloured labour. This statement is made in face of the fact that since the introduction of cotton-ginning machinery by the Queensland Department of Agriculture, and the gratuitous distribution by that Department of cotton seed, the farmers who have planted it year after year have made good profits by their enterprise. Each succeeding year the number of growers has increased, and it is no exaggeration to say that many have succeeded in making more money per acre out of cotton than by any other crop, not excluding sugar-cane.

Lately, a gentleman (Mr. Crawford Vaughan, ex-Premier of South Australia) representing a British company formed for the purpose of encouraging the growing of cotton in some suitable country within the British Empire, has visited, among other territories, Queensland, for the second time this year. In a report presented to the State Premier, Hon. E. G. Theodore, on the progress of the movement, he stated that, having previously visited many tropical and semi-tropical countries where cotton is grown, he had come to the conclusion that Queensland to-day presents the best conditions for the industry.

"The British Government had," he said, "set aside a sum of £1,000,000 for the encouragement of cotton-growing within the Empire, a portion of which would be devoted to establishing the industry in Queensland." This fact alone warranted his company in deciding, after studying the climate, localities, soils, and means of transport from farms and plantations to a shipping port, that the cotton industry could be firmly implanted here on a very satisfactory basis. Matters had now progressed so far as the importation by his company of three up-to-date cotton-growing plants, which, presumably, include cotton gins, linter machines, baling presses, and other appliances. These will arrive here in time to deal with the next cotton crop, which is expected to be a comparatively heavy one, and will be set to work in three different districts where the most cotton is at present grown.

There is a large area under cotton this season in the State, and, notwithstanding a spell of dry weather in one or two districts, the crop, generally, promises to be a large one, and it is probable that more gins will shortly be installed.

Mr. Vaughan, on his first visit to Queensland about ten months ago, secured samples of Queensland cotton from several localities in the south, north, and west, some of which was grown on the coast, and others on the tableland and western plain country. On his return to England he submitted them for the opinion of cotton brokers, who unanimously commented most favourably on the samples as possessing all the best qualities of the more valuable cottons of other countries (probably including America, Egypt, Africa, and India) in respect of length and strength of fibre, colour, and other desirable attributes.

It has long been known that the western districts of Queensland, particularly the Warrego, Maranoa, Condamine, and other districts, including the Darling Downs, produce a very fine class of cotton, mainly Uplands (short staple). Very little Sea Island cotton has been grown, although this long-staple variety is of greater value than the Uplands, which are all short-staple, except some crossbred varieties, which carry a longer fibre, whilst the Sea Island is prized by cotton buyers for its length and silkiness of the fibre. The latter class prefer the saline atmosphere of the coast to the drier western plains, but it is probable that much of this variety will be sown next year, both on the coast and inland, when suitable seed is available.

On the first introduction of cotton-growing in Queensland (about the year 1858) the Sea Island variety was grown in the Logan district, but conditions there appear not to have been favourable for its cultivation in those early days. Furthermore, the only gins brought out by intending growers were small, hand-driven machines which were unable to turn out more than a few pounds of lint per day. The present-day saw-gins will turn out up to 2 tons a day, while the lintering machines will remove all fluffy cotton adhering to the seed of Upland cotton after the latter has passed through the saw-gin. A large quantity of cotton which was formerly thrown away with the seed is now saved by means of the "linterer." Roller gins are used for long-staple cotton. It is singular that, although experiments without number have been made by planters and others in the hybridising and crossing with the best varieties of Sea Island, Egyptian, and other cottons, few of the new kinds have been obtainable, even from America or from other centres of the cotton-growing industry, the only ones in Queensland being Russell's Big Boll, Jones's Improved, and one or two others.

One thing—and this is a most important point in favour of Queensland as a cotton-producer—is that the plant is practically free from diseases which are ravaging the cotton districts of the United States and Egypt to such an extent that the States, it is feared, will not be able to produce a 14,000,000 bale crop, and supply their own cotton factories as well as producing an exportable surplus.

There is nothing new to say about cotton-picking machines. A reference to past numbers of the "Queensland Agricultural Journal" will suffice to show that the successful mechanical cotton-picker has not yet made its appearance in any part of the world. A machine which gave promise of great success was, some years ago, invented by Mr. Daniel Jones, one of the pioneer cotton-growers of West Moreton, and to whose enthusiasm and practical knowledge the present encouraging condition of the industry is largely due. This machine eventually was not so successful as was anticipated. Since then, others have appeared on the scene, only to suffer a like

fate. The latest one made the nearest approach to success. It worked by pneumatic suction. As the machine passed through the cotton rows, the bolls, or rather the cotton hanging from the burst bolls, was sucked from the open boll and passed in to a receiver. It had, unfortunately, one defect, which sent it to the limbo of former failures. The fault was that the powerful suction took in both ripe and unripe cotton. I have heard of no later invention.

But, considering all things, with a complete knowledge of the history of cotton-growing in Queensland and of the areas within our borders naturally adapted for its successful propagation, I have no doubt that the present revival in the cotton industry will end in cotton becoming a great wealth-winner, and one of our staple products.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 25.

A WESTERN BURR (*Sida platycalyx*).

For some years past we have from time to time received samples of a large, flat, somewhat disc-like burr taken from wool received from Western Queensland. Beyond placing the burr as the seed-vessel (carcerulus) of some plant of the Mallow family, further determination was found impossible. Now, however, we have received from the Australian Estates and Mortgage Company, Limited, several specimens of the plant bearing the burr, gathered by Mr. P. Tully on Ray Station in the Adavale district. The plant proves to be *Sida platycalyx*. The genus Sida is one containing several very common weeds, such as the *Sida retusa, Sida acuta,* Flannel Weed (*Sida cordifolia*), &c.

Description.—A small woody plant, densely clothed in all parts with a woolly floccose, stellate tomentum. Leaves broadly ovate or orbicular, slightly cordate, crenate, 1-1¼ in. long, on a petiole (leaf-stalk) of ¾ to 1 in. long. Flowers on pedicels (flower-stalks) as long as the leaves, the pedicels articulate above the middle. Calyx broadly companulate about ½ in. across, each lobe marked with three longitudinal ribs, with an intermediate rib on the tube below the junction. Lobes broadly triangular. Petals bright yellow, 6 to 7 lines long. Stamens numerous, staminal column short, carpels about 24, closely packed in a tomentose ring round the base of the styles, which are free almost to the base, with small capitate stigmas. Fruiting calyx enlarged, completely enclosing the ripe carpels (burr), marked with numerous longitudinal veins. Carpels echinate, with rather long hirsute spines, indehiscent and adherent to one another, forming a ring or disk-like burr nearly 1 in. in diameter and ½ in. in depth. Seeds greyish-brown, 1½ lines long, oval or somewhat kidney-shaped.

Distribution.—North Australia, Central Australia, New South Wales (?), and Western Queensland.

Botanical Name.—*Sida,* believed to have been the Greek name of some plant of the Mallow family; *inclusa,* Latin, meaning confined, referring to the burr being enclosed in the enlarged calyx.

Germination.—The method of germination is worthy of note; the carpels, unlike most species of *Sida, Malva, Abutilon,* &c., are indehiscent; that is, they do not split open and shed the seeds. Instead, the whole burr becomes buried in the soil and several seeds germinate. The burr remaining in the ground round the plants can be seen as in the accompanying illustration.

Botanical Notes.—*Sida platycalyx,* F. v. Muell. Herb., Benth. "Fl. Austr.," I., 197; Bail. "Queensl. Flora," I., 115; F. v. Muell., "Vic. Naturalist," V., 138. *Sida inclusa,* Benth. "Fl. Austr.," 197; Bail. "Queensl. Flora.," I., 115, F. v. Muell. "Fragm. Phytogr. Austr.," IX., 131, and XI., 32.

Sida platycalyx was described from flowering and *Sida inclusa* from fruiting specimens. They were originally described on the same page in the "Flora Australiensis," and from the complete specimens now to hand I have no hesitation in uniting the two. *Sida platycalyx* has been recorded by Mueller l.c. from the Bulloo River, South-Western Queensland. He also records it for New South Wales in his Second Census, but Maiden and Betche in their recent "Census of New South Wales Plants" do not recognise it as a New South Wales species. It is most likely that it does occur in the North-Western parts of that State, though several records are made by Mueller in his "Second Census" that cannot be backed up by authentic material in any of the larger Australian Herbaria.

PLATE 15.—A WESTERN BURR (*Sida platycalyx*).

A.—Two plants growing from an old Burr.
B.—Burr enclosed in the enlarged calyx (viewed from below).
C.—The same (viewed from above.)
D.—Older Burr freed from the calyx.
E —Seeds.

TWO VINES REPUTED POISONOUS TO STOCK.

Recently the Stock Inspector at Beaudesert (Mr. J. H. McCarthy) forwarded to the Department two specimens of vines which he suspected as causing losses among stock in his district.

In one case the loss of five head of calves was reported on a property at Tambourine Mountain, and it was noticed that the calves had eaten freely of a particular vine known locally as "Milk Vine." On examination by Mr. C. T. White, F.L.S., Government Botanist, this proved to be *Marsdenia rostrata*, a plant of the family *Asclepiadeæ* and a close ally of the *Hoya*, which is well known as a vine poisonous to stock. The family *Asclepiadeæ* is one that contains several poisonous plants, both in Australia and abroad, so it is quite likely that the *Marsdenia* was in this case the cause of the trouble. It is a soft vine with rather light-green leaves, and bears tufts of white Hoya-like flowers in the leaf axils. Every part of the plant, when broken, exudes a milky sap.

In the other case several losses were reported from Kerry, and the animals were noticed eating a small vine growing in the forest country. This plant proved to be *Secamone elliptica*, of the same family as the *Marsdenia*. It is a slender vine with narrow leaves and small greenish flowers. When cut or broken, it exudes a milky juice. Both plants bear green pods (follicles) which, when ripe, burst open longitudinally, allowing the seeds to escape. The seeds are numerous in the pod, and each is provided at one end with a tuft of long white, silky hairs.

CANE-BEETLE CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (20th December, 1921) from the Entomologist, Mr. E. Jarvis:—

"EMERGENCE OF CANE-BEETLES.

"As a result of showery weather between the dates 26th and 31st October, which gave a precipitation of 1.40 in., 'grey-back' beetles emerged rather freely from volcanic and other soils around Gordonvale, in which pupation had taken place within reach of the plough. Pupæ located in such situations probably feel the effect of solar warmth earlier than those lying at greater depths or in heavy clay-loam lands. At Highleigh the first appearance of the pest attracted some attention, the beetles being very numerous on various food plants bordering the main road, and congregating in thousands on some large fig-trees (*Ficus benjamini*) close to the residence of Mr. J. Cannon. The native food plants found to be mostly affected in this district on 11th November were the Moreton Bay Ash (*Eucalyptus tessalaris*) and one of the rough-leaved figs (*Ficus opposita*), the latter species, however, being, as a rule, seldom eaten unless far removed from other more favoured feeding trees.

"Twenty-nine beetles were collected from one of many small bushes of eucalyptus about 5 ft. high, growing on a roadway in the midst of cane land, fifteen of these being male and fourteen female specimens.

"Again, forty-eight beetles collected earlier, at random, from gums around the laboratory close to canefields, between the dates 4th to 7th November, and placed separately in cages for experimental purposes, were found, when examined after death, to consist of thirteen males and thirty-five females.

"The above figures substantiate data already published by the writer in 1915 ('Australian Sugar Journal,' Vol. VI., p. 891), and show the importance of collecting beetles from feeding trees close to headlands during the three weeks following emergence, before egg-laying commences.

"On the 18th November we had an additional fall of 1.36 in. of rain, and three days later a second lot of 'grey-backs' found their way to the surface. On one plantation of first ratoons at Meringa, for instance, as many as five beetles emerged from beneath each stool of cane, which means that the beetles arising from every acre of this land are sufficient to produce, later on, enough grubs to destroy fully 9 acres of cane.

"LIGHT TRAPS.

"Some rather interesting observations were made during several evenings between the 4th to 26th November regarding the tropic reaction of *albohirtum* to artificial light. The trap employed was a simplification of that designed and figured by the writer in 1916 ('Australian Sugar Journal,' Vol. VII., p. 903); and in the present instance consisted of an empty kerosene case fitted with side platforms and vertical barriers of galvanised iron, the latter being glazed where coming opposite the burner of an acetylene lamp of 21 litres capacity.

"Early in the month few beetles were caught, as the moon happened to be nearing the end of its second quarter, and, moreover, temperatures between the hours of 8 to 9 p.m., while beetles were on the wing, were rather low. During these few nights it was noticed that grey-backs, when approaching the trap, were inclined to circle around it, influenced possibly by the moonlight, and that, if failing after several short flights to reach their objective, ceased to be attracted, and suddenly became motionless. When this stage had been reached a bright flame placed 2 in. from the head of the beetle did not affect it in the least, clearly indicating a cessation of positive phototropic reaction for the time being. On the 26th November, from 8 to 9 p.m., four specimens of the so-called Christmas Beetle (*Anoplognathus boisduvali*) entered the trap, and only fourteen grey-backs, the temperature having dropped in the course of an hour from 82 to 72 degrees Fahr.

"Beetles belonging to the second emergence will commence invasion of the canefields about the 10th December, when it is hoped to secure further data regarding the influence exercised at that time by artificial light on male specimens and egg-laden females.

"ATTRACTIVE AROMAS FOR CONTROLLING CANE BEETLES.

"This line of work has consisted in the preparation and exposure in the field and feeding trees during night time of various odours, one of which, it is hoped, may be found attractive to the adult beetles.

"The principal substances experimented with have been (1) those considered likely to prove palatable as food; (2) chemicals possessing aromas resembling those emanating from the chief food plants of the beetle; and (3) miscellaneous odours such as arise from decaying vegetation, soils, roots, &c.

"This experimentation is of decided importance, as in the event of any success being obtained, it would then be a simple matter to design suitable traps, which, when baited with the attractive substance, could be so arranged in a canefield as to lure to destruction from different directions most of the invading beetles.

"It may be of interest to state that my hopes regarding this form of control were stimulated after making a microscopical examination of the antennæ of *albohirtum*, our common grey-back cane beetle. The sense of smell in insects is known to reside principally in these organs, and in the case of the beetle under consideration the laminæ, or plates composing the antennal club, are very highly specialised, the surface of each of the four plates in that of the female being closely covered with many thousands of minute pits or pori, each containing a central rod connected with the olfactory nerve. I found these pits to occur in even greater numbers in the club of the male, which is provided with an additional plate for their accommodation.

"Doubtless it is this keenness of scent which enables our cane beetle to locate from a distance certain favourite feeding trees.

"This line of research is well worth investigation; and should any grower chance to notice grey-back beetles assembling in numbers on or around objects other than feeding trees, in such manner as to suggest their having been attracted, it would be advisable to communicate at once with the entomologist, either by wire or 'phone (Tel. 95 Gordonvale). The accompanying photograph illustrates experimentation with aromas exposed in traps hung among the branches of *Ficus pilosa*, and grey-back beetles eating the leaves of this favourite food-plant. The insect (one-third full size) shows characteristic injury.

"EGGS OF BEETLE KILLED BY FUMIGATION.

"On 19th November, eggs of the grey-back beetle were obtained from caged females in our insectary, and three days later placed in flower pots of moist soil and fumigated with carbon bisulphide.

"Two eggs were put in the bottom of each pot in a small cell roofed by a compacted piece of earth, and covered with from 130 to 280 cub. in. of soil. The bisulphide was then administered at distances varying from 4½ to 8 in., the dose in each case being two drachms (¼ oz.). In field practice, if a couple of injections were given to each stool of cane, the above dose works out at about one drum per acre.

"Twenty-four hours after treatment the eggs were taken from each pot and placed in glass cells, in order that developments might be closely observed. Little change was apparent for two days, except that the treated eggs darkened slightly and did not increase in size; but on the 25th November (three days after fumigation) the control eggs had become noticeably larger and remained creamy-white, while the treated specimens were dark-brown and partially covered by mould.

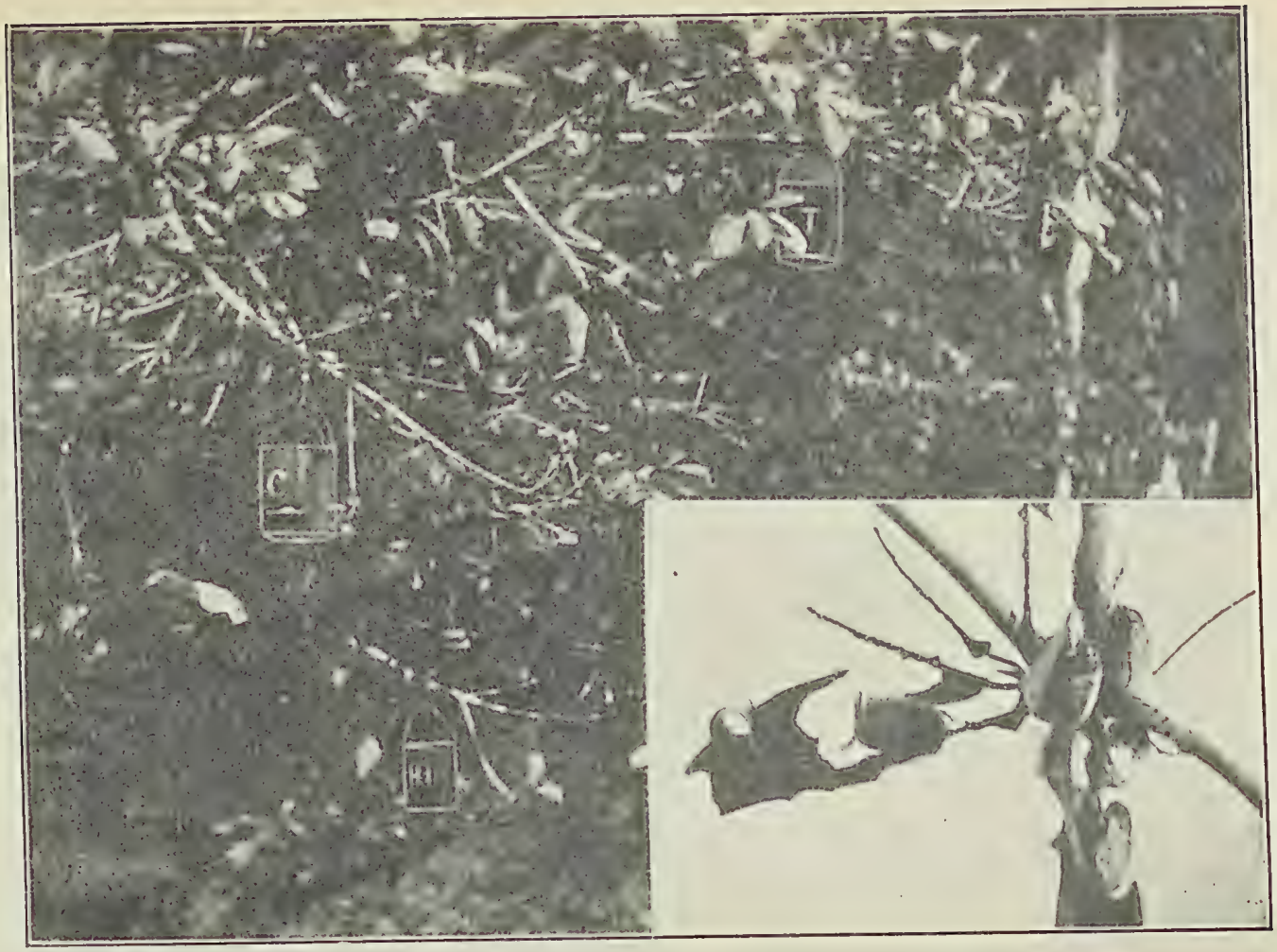


Photo. by E. Jarvis.]

PLATE 16.—EXPERIMENTATION WITH AROMAS AGAINST THE "GREY-BACK" CANE-BEETLE. Note bait-trap hung among branches of feeding-tree (*Ficus pilosa*). INSET.—Cane-beetles devouring foliage of same (½ full size)

"By 1st December all that remained of the latter was the shrivelled egg-shells (chorion), each in the midst of a patch of mould on the soil; while the untreated eggs—submitted to exactly the same conditions of moisture and temperature—were perfectly normal, free from any sign of mould, and had developed to nearly a quarter of an inch in diameter. This experiment was repeated on 24th November, with varying doses of bisulphide, the same results being obtained in every case. We may safely conclude from the above details that such fumigation kills the eggs in a few hours, although, naturally, mould does not appear on the chorion until the internal albuminous matter commences to decompose.

"This discovery is not without value, since the knowledge gained enables us to start fumigation, if desired, as soon as the eggs are deposited, thus allowing more time in which to get over a big plantation while the cane is still small.

"TRAP-TREES FOR KILLING BEETLES.

"Continuing research work in this connection, initiated by the writer in 1915 ('Australian Sugar Journal,' Vol. VII., p. 62), five sets of experiments have been conducted between the dates 5th November to 2nd December, comprising eighty-nine cages containing leaves sprayed with various arsenical solutions. The data secured will be published next month.

"PARASITE OF MOTH-BORER.

"Three years ago (November, 1919) the writer was fortunate in breeding a *Braconid* wasp (*Apanteles nonagriae* Oll.) from our large moth-borer of cane (*Phragmatiphilia truncata* Walk.).

"This parasite, which was first recorded by Oliff in 1893, is thought to be of great value in New South Wales, where it helps to control the ravages of the same moth-borer.

"It had not, however, been previously recorded from Queensland, so that its presence at Pyramid in 1919 is of considerable economic interest. As mentioned in my October report, we were hoping to obtain specimens of this useful parasite again, in order to breed numbers for distribution in the Lower Burdekin, or other districts where it is proving troublesome. I am glad to state that our search has been successful, and a number of specimens have quite recently been bred from ratoons collected at Banna, near Gordonvale.

"The subsequent rearing of these tiny wasps at the laboratory will be very interesting, as the technique and methods of handling such insects differ in many respects from those adopted when breeding tachinid fly parasites of the beetle-borer."

THE BANANA BEETLE BORER.

(*COSMOPOLITES SORDIDA* Chev.)

(*Curculionidæ.*)

[SECOND PROGRESS REPORT.]*

BY JOHN L. FROGGATT, B.Sc., Entomologist in Charge of Banana Beetle Borer Investigations.

The observations and conclusions embodied in the following report cover the period from July to December, 1921.

(Plates 17 and 18.)

THE EGG.

Both field and laboratory observations have shown that oviposition has been continuous throughout the year. In the field, eggs have been found in corms and stems, while in the office the imagos under observation (compare Table B) have deposited a large number of eggs in the pieces of corm on which they were feeding. In every case the eggs were laid singly, and generally just below the surface, in small, slightly-curved

* *Ib.* First Progress Report. Bull, Division Entomology and Vegetable Pathology, August, 1921. Reprint, "Queensland Agricultural Journal," Vol., XVI., pp. 200–8, Sept., 1921.

burrows. That eggs are deposited in the plant below the surface of the soil was shown in some plants in which the larval tunnels were well towards the base of the corm, no trace of tunnelling being present through the upper half of the corm. This is, however, not general.

The following table gives the total number of eggs laid in each month by these different lots of beetles under observation. The beetles in each lot (given in Table B) comprised a proportion of males, but one not always constant, their number too varied, as death lessened this.

—	A.	B.	C.	D.	E.	F.	G.	I.	J.	K.	L.	M.	Total.
July	21	21	65	36	4	39	289	208	17	..	..	..	700
August	4	2	16	3	0	6	64	56	17	21	..	..	189
September	25	19	66	17	2	48	90	69	68	72	45	..	521
October	104	81	235	111	22	144	343	323	196	268	142	..	1,969
November	42	50	142	44	20	117	388	299	129	223	125	15	1,595
To 15th December ..	7	4	7	5	2	7	25	29	9	24	33	3	155
Individual totals July to 15th December	203	177	531	216	50	361	1,199	984	436	608	345	18	5,129
Laid 25/5/21–30/6/21	39	60	149	44	0	84	354	339	..	..	..	..	1,069
Full Totals ..	242	237	680	260	50	445	1,553	1,323	436	608	345	18	6,198

The egg production fell considerably with the cold weather, but did not cease completely, and recovered again with the advent of warmer climatic conditions. The marked drop in egg production in December is difficult to explain unless further observation shows the effect of hot weather to be similar to that of cold weather.

Oviposition does not seem to be marked into definite periods, as would occur with the development of one batch of eggs followed by a period of quiescence while another batch was developed, but rather to be a continuous function.

A large proportion of the eggs laid by these lots of beetles were transferred to incisions made in pieces of fresh corm, and were closely observed in order to ascertain the time taken for the egg to mature. The results of observation may be briefly summarised as follows:—

Eggs laid between 16th and 29th June, 1921, matured in 19 to 20 days (average).

Eggs laid between 29th June and 27th July, 1921, matured in 26 to 32 days (average)

Eggs laid between 29th July and 26th August, 1921, matured in 24 to 27 days (average).

Eggs laid between 29th August and 26th September, 1921, matured in 11 to 15 days (average).

Eggs laid between 26th September and 28th October, 1921, matured in 10 to 12 days (average).

Eggs laid between 28th October and 25th November, 1921, matured in 7 days (average)

The longest period passed in the egg stage was in the case of eggs land between 25th and 27th July, 1921, the eggs maturing in 35 to 37 days. The variations of different series of eggs were more marked than are shown by these figures, but all showed the lengthening of the egg period as the cooler part of the year was being realised, and a

gradual decrease as warmer climatic conditions set in. The moisture content of the corm on to which the eggs were transferred as well as variations in temperature account largely for these variations, a dry condition of the corm as also a lowering of temperature inhibiting development.

[*Note.*—During the earlier portion of the period summarised above, great difficulty was experienced in carrying out this work through the development of fungus growths in the incisions in the corm to which the eggs were transferred. The long egg period allowed ample time for a heavy development of these growths which, often covering the eggs, destroyed a number of them, and always rendered observation difficult.

Small Staphylinid (sp.) larvæ and mites were also troublesome during the longer egg-periods.]

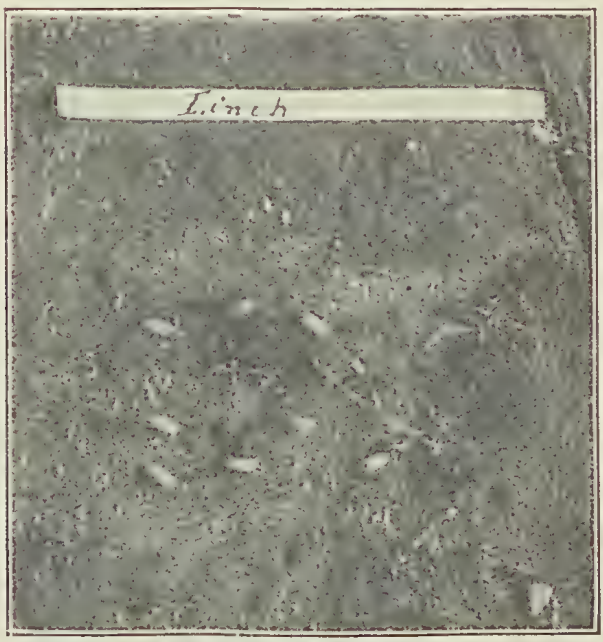


PLATE 17.—Eggs of *C. sordidus* transferred for observation.

LARVA AND PUPA.

On account of the larval and pupal stages being both passed within the corm, it has not always been possible to determine exactly the time passed in each of these stages. For this reason, generally, the larval and pupal periods have had to be calculated together and the period of each stage deduced from other independent observations.

It was found that from larvæ emerging in June and early in July, 1921, there were passed about 130 days in the larval and pupal stages, while from larvæ emerging in October there was passed less than half this time in the two stages; through November these periods were still further reduced. Details of these observations are given in Table A.

Pupæ collected in June matured in a minimum of 20 to 28 days, while in September this period was reduced to a minimum of 10 to 14 days. From this it may be assumed that the larval periods during the same time were at least 60 to 80 days and 30 to 40 days, respectively.

THE IMAGO OR BEETLE.

The average full life-cycle (from egg to imago), from eggs laid in June, was 120 days; in September, 62 to 63 days; in October, 48 to 59 days; in November, 31 to 33 days (only one observation).

No attractant or deterrent, either physical or chemical, has as yet been found effective for application to plantation requirements.

Continued observations on the length of life of the beetle show that it is a very long-lived insect. The results obtained from observations made on beetles feeding on corn in tins in the office that are embodied in Table B indicate this. In Lot F, for example, there have been no deaths since 9th May, which was only a few days after emergence of the beetles. In Lot A, collected 29th January, 1921, there are still 17 beetles alive (47·4 per cent.) out of a total of 38.

PLATE 18.—Newly emerged Imagos of *C. sordidus*.

The beetles comprising Lots E, M, N, and O were bred from pupæ; otherwise all the beetles were collected in the field, their age when taken being, of course, unknown.

During the winter months the rate of mortality amongst newly-emerged imagos was very high. This may have been due, in part, at least, to the rapid development of fungus growths on the corm affecting the imagoes before they were fully developed.

Both field and laboratory observations show that the imagoes will often begin to feed before they have attained their full (black) colour.

Eggs were deposited by the imagos of Lot E between 11th and 13th July, 1921; the imagos emerged from the pupæ between 22nd and 27th April, 1921, thus mating and subsequent development of eggs took place within 75 to 82 days of emergence of the imagos. With the imagos of Lot M this period was very much shorter; the imagos emerged between 11th and 27th October, 1921, and the first eggs were deposited between 14th and 17th November, 1921; thus mating and egg-development took place within a maximum of 34 to 37 days from emergence.

The Department, acting in co-operation with that of New South Wales, secured from Java a consignment of a predaceous beetle (*Placsius javanus*), belonging to the Histeridæ, an enemy of the banana beetle borer (*Cosmopilites sordidus*). This comprised 388 beetles, of which 304 were alive (slightly more than 78 per cent.). These were liberated in a small plantation where the banana beetle borer infestation was severe. They were liberated in this manner in order that they might be under closer control than if generally distributed, and under better conditions for observation. Jepson* states the period from egg to beetle of this parasite is a long one, so that it will not be possible to arrive at any conclusion on the activity of *P. javanus* for some time.

No indigenous parasites of *C. sordidus*, other than those mentioned in the First Report, have been found throughout the areas traversed.

PLANT RELATIONSHIPS.

Further observations in the field have failed to show any difference in the relative frequency of attack or relative degree of damage in different varieties of banana plants by *C. sordidus*. Neither has it been observed that disease of a plant, or plant portion, influences the selection of site for oviposition.

CONTROL.

It has been constantly found that, in "trapping" the beetle by means of corm "baits," the best "bait" is obtained by splitting the corm so as to include a small portion of the base of the stem; such baits present a moister surface for a longer time than those composed of the heart of the corm.

A series of tests has been started to ascertain the efficacy of poisoned "baits" as a means of destruction of the beetles. These tests are, however, not yet sufficiently far advanced to enable conclusions to be formed.

Old infested plantations that have been abandoned or left to run out are a most decided menace to the banana grower, as they represent large undisturbed breeding-grounds for the pest, from which it can, and *does*, spread into adjacent clean plantations. As an illustration of this point (one which cannot be too strongly stressed), a new plantation alongside an old infested area, though free from beetle borer early in the year, was found infested in the spring in the two rows adjoining the old area.

To reiterate previous advice on this matter, any old areas adjacent to plantations should be carefully examined, and, where beetle borer is found to be present, corm "baits" should be laid around the edge of, and, as far as possible, throughout the infested area; the baits must be carefully watched, and all beetles "trapped" must be destroyed. Whenever opportunity offers, it is to the grower's own advantage to dig out and destroy the infested material.

SUMMARY OF CONCLUSIONS.

1. The beetle has a long life, and the females deposit eggs continuously.

2. Breeding, although continuous throughout the year, is much slower in the winter months.

3. The results to date go to show how necessary it is to prevent the pest breeding by, as far as possible, destroying breeding-grounds and harbourage, and by destroying all beetles as soon after emergence as possible, by continuously "trapping."

* Jepson, Bull. 7, Dept. of Agric., Fiji, 1914. ". . . about six days in the egg stage, many months in the larval stage, and about four weeks in the pupal stage."

TABLE A.—PERIODS OF LIFE CYCLE.

Eggs Laid.	Larvæ emerged.	Larvæ Pupated.	Imagos Emerged.	Egg Period In days.	Larval Period in days.	+Pupal Period in days.	Full Life Cycle in days.
8–10/6/21	26–28/6/21	..	20/10/21	18	114–116	..	132–134
13–16/6/21	3–6/7/21	..	12–22/10/21	20	98–111	..	118–131
13–16/6/21	3–6/7/21	..	11/10/21	19–17	97–100	..	116–117
29/6/21—1/7/21	19–20/7/21	..	15/10/21	19–20	87–88	..	106–108
20–22/9/21	2–5/10/21	..	20/11/21	12–13	(46–49)	..	59–61
20–22/9/21	2–5/10/21	..	2–6/12/21	12–13	(65–72)	..	71–77
22–26/9/21	5–10/10/21	by 15/11/21	18–23/11/21	14–13	39–49	..	53–62
22–26/9/21	3–8/10/21	by 15/11/21	21/11/21	13–11	(44)-49	..	56–60
22–26/9/21	5–6/10/21	by 15/11/21	19–20/11/21	10 13	41–46	..	54–59
22–26/9/21	5–8/10/21	18/11/21	28/11/21	12–13	41–44	p.p. 10	6–67
22–26/9/21	3–8/10/21	..	2/12/21	12–11	55–60	..	67–71
22–26/9/21	5–10/10/21	..	2–3/12/21	14–13	53–59	..	67–72
22–26/9/21	5–8/10/21	..	30/11/21	12–13	53–56	..	65–69
26/9/21—5/10/21	8–16/10/21	by 22/11/21	22–28/11/21	11–12	37–51	..	48–63
26/9/21—5/10/21	6–16/10/21	by 22/11/21	22–28/11/21	11–10	37–53	..	48–63
26/9/21—5/10/21	8–17/10/21	by 22/11/21	26–28/11/21	12	40–51	..	52–63
26/9/21—5/10/21	6–16/10/21	by 22/11/21	22–28/11/21	11–10	37–53	..	48–63
26/9/21—5/10/21	6–17/10/21	by 22/11/21	26–28/11/21	12–10	(41)–53	..	52–63
29/9/21—6/10/21	15–20/10/21	..	2–12/21	14–16	43–48	..	57–64
5–10/10/21	17–23/10/21	..	1–11/12/21	12–13	40–55	..	51–67
10–13/10/21	21–24/10/21	..	1–11/12/21	11	39–51	..	49–62
10–13/10/21	21–24/10/21	..	1–11/12/21	12–11	37–51	..	49–62
10–13/10/21	21–24/10/21	..	1–11/12/21	11	39/51	..	49–62
13–18/10/21	24–30/10/21	..	1–11/12/21	11–12	32–48	..	44–59
13–18/10/21	23–30/10/21	..	1–11/12/21	10–12	30–47	..	44–59
13–18/10/21	24–31/10/21	..	1–11/12/21	13–11	31–48	..	44–59
13–18/10/21	24–31/10/21	..	1–11/12/21	13–11	31–48	..	44–59
18–21/10/21	30/10/21—3/11/21	..	8–11/12/21	13–12	35–42	..	48–54
21–25/10/21	30/10/21—3/11/21	..	8–12/12/21	9	35–43	..	44–52
21–25/10/21	30/10/21—3/11/21	..	8–11/12/21	9	35–42	..	44–51
25–28/10/21	2–7/11/21	by 8/12/21	12–13/12/21	10–8	35–41	..	45–49
9–11/11/21	16–18/11/21	by 6/12/21	11/12/21	7	24–26	..	31–33

TABLE B.—LONGEVITY OF IMAGOS.

——	A.	B.	C.	D.	E.	F.	G.	I.	J.	K.	L.	M.	N.	O.
Date Collected.	21/1/21	7/2/21	12/2/21	20/4/21	27/4/21	5/5/21	21/5/21	4/6/21	19/7/21	1/8/21	16/9/21	11–27/10/21	15–21/10/21	25–28/10/21
Number Collected.	38	132	281	37	16	87	379	324	85	119	72	6	24	20
% Alive on—														
1/7/21	61	29·5	34·5	86	56	98	97	98·7	..	..	..	..	..	..
5/7/21	61	29·5	34	86	56	98	97	98	..	..	..	..	..	..
7/7/21	61	29·5	34	86	56	96·5	97	98	..	..	..	..	..	..
11/7/21	61	29·5	34	86	56	96·5	97	98	..	..	..	..	..	..
13/7/21	61	29·5	34	86	56	96·5	97	97·6	..	..	..	..	..	..
15/7/21	61	29·5	34	86	56	96·5	97	97·6	..	..	..	..	..	..
21/7/21	61	29·5	34	86	56	96·5	97	96·3	100	..	..	..	..	..
25/7/21	61	29·5	34	86	56	96·5	97	96·3	100	..	..	..	..	..
27/7/21	61	29·5	34	86	56	96·5	96·8	96·3	100	..	..	..	..	..
29/7/21	61	29·5	34	86	56	96·5	96·8	96·3	100	..	..	..	..	..
13/8/21	61	29·5	34	86	56	96·5	96·5	96·3	100	100	..	..	..	..
19/8/21	61	29·5	34	86	56	95·4	96	95·9	100	100	..	..	..	..
24/8/21	61	29·5	34	86	56	95·4	95·8	95·3	100	100	..	..	..	..
26/8/21	61	29·5	34	86	56	95·4	95·8	94·7	100	100	..	..	..	..
29/8/21	61	29·5	34	86	56	95·4	95·8	94·4	100	100	..	..	..	..
20/9/21	55·3	29·5	34	86	56	95·4	95·2	94·1	100	100	100	..	..	..
22/9/21	55·3	29·5	34	86	56	95·4	95·2	93·8	100	100	98·6	..	..	..
26/9/21	52·6	29·5	34	86	56	95·4	94·7	93·5	100	100	94·4	..	..	..
6/10/21	52·6	29·5	34	86	56	95·4	93·7	93·5	100	100	88·9	..	..	..
10/10/21	52·6	29·5	34	86	56	95·4	93·7	92·6	100	99·1	88·9	..	..	..
13/10/21	52·6	29·5	33·4	86	56	95·4	93·6	92·3	100	97·4	88·9	..	..	..
18/10/21	52·6	29·5	33·4	86	56	94·3	93·1	91·9	100	97·4	86·1	..	..	..
21/10/21	52·6	28·8	33·4	86	56	94·3	93·1	91·7	100	97·4	80·6	..	..	..
25/10/21	52·6	28·8	33·1	86	56	93·1	92·4	91·7	100	96·6	80·6	..	..	..
28/10/21	50	28·8	33·1	86	56	93·1	92·4	91·7	100	96·6	80·6	100	..	..
4/11/21	48·2	28·8	33·1	86	56	93·1	92·1	90·7	98·8	96·6	80·6	100	..	..
9/11/21	48·2	28·8	32·7	83·8	56	93·1	91·8	89·9	98·8	96·6	77·8	100	..	..
11/11/21	48·2	28·8	32	83·8	56	93·1	91·5	89·9	97·6	95·8	77·8	100	..	..
14/11/21	48·2	28·8	32	83·8	56	93·1	91·5	89·8	97·6	95·8	77·8	100	..	..
17/11/21	48·2	28·8	32	83·8	56	93·1	91·5	87·9	97·6	94·9	73·6	100	..	..
21/11/21	48·2	28·8	32	83·8	56	93·1	91·2	87·9	97·6	94·9	72·2	100	..	..
25/11/21	48·2	28	31·3	78·4	56	91·9	90·8	87·8	96·5	94·9	72·2	100	100	..
8/12/21	47·4	28	31·3	78·4	56	91·9	89·4	86·5	96·5	94·1	72·2	100	95·8	90
9/21/21	47·4	28	31·3	78·4	56	89·6	89·4	86·5	96·5	94·1	72·2	100	95·8	90
13/12/21	47·4	28	30·9	78·4	56	89·6	88·9	85·2	95·3	93·3	72·2	100	95·8	90
15/12/21	47·4	28	30·6	78·4	56	89·6	88·6	82·6	92·9	93·3	72·2	83·3	95·8	90

"Breeding-grounds" comprise old corms either in the stools or dug out and left lying on the ground, and also cut stems left lying on the ground. If these are chopped up into small pieces they will rot or dry up too quickly to allow time for the larvæ to reach maturity.

"Harbourage" consists principally of plant material lying in and around the stools. This forms an ideal shelter for the beetles. Decaying stems also form "harbourage" (and also, possibly, feeding-grounds) for the beetles.

CASTRATION OF THE FEMALE.

By A. H. CORY, M.R.C.V.S.

Ovariotomy (Speying).—The operation should be performed when the cow is in her prime and gives her greatest flow of milk, care being taken that she is in good health and moderate condition, not too plethoric; or, on the other hand, she must not be at all anæmic, and not in heat or pregnant. This operation may be performed in one of two ways—namely, by the flank or by the vagina—each operation having its special advantages. In the flank operation the animal may be operated upon either while standing or in the recumbent position. If standing, she should be placed against a wall or a partition and her head held by a strong assistant. The legs also must be secured to prevent the animal from kicking. A vertical incision should be made in the left flank, about the middle of the upper portion, care being taken not to make the opening too far down, in order to avoid the division of the circumflex artery which traverses that region. The operator should now make an opening through the peritoneum, which is best done with the fingers. Next introduce the hand and arm into the abdominal cavity and direct the hand backward toward the pelvis, searching for the horns of the uterus. Follow them up and the ovaries will easily be found. They should then be drawn outward and may be removed, either by the coraseur or by torsion. Closing and suturing the wound will complete the operation. An adhesive plaster bandage can be beneficially applied.

TAPE WORMS IN SHEEP AND LAMBS.

By A. H. CORY, M.R.C.V.S.

Symptoms.—Eight varieties of tapeworms are known to infest the bowels of sheep. Lambs will not fatten when harbouring these worms; they become unthrifty and hidebound, and the wool is hard and poor in quality. The animals appear stiff when moving, and generally hang behind the flock when being driven.

Tapeworms produce emaciation, with paleness of the mucous membrane of eyes, nose, mouth, &c. The function of the digestive organs is impaired, the cud being chewed irregularly, breath unpleasant, occasional colic, tympany of abdomen, and diarrhœa with mucus, in which is frequently found segments of the tapeworms. The sheep ultimately die from poverty and exhaustion.

Prevention.—Prevention consists in draining damp land, stagnant waterholes, &c., and by keeping uninfested sheep from known infested pastures. Infested pastures should, where practicable, be ploughed or dressed with salt, lime, or sulphate of iron, allowing about ½ cwt. per acre. Avoid overstocking.

Treatment.—For treatment of 6-months-old lambs, fast animals for eight or twelve hours, and give the following:—

Oil of turpentine	1 drachm
Powdered areca nut	25 grains
Extract of male fern	15 drops
Linseed oil	1 oz.

Repeat the dose once weekly for three weeks. Increase the dose according to age of animal.

Where it is not practicable to drench sheep, 25 to 60 grains of areca nut (according to size of animal) should be given to each sheep, on two or three occasions, mixed in some bran or other food.

A lick composed of one part sulphate of iron to eight parts of salt should be available to sheep in troughs, allowing about ½ oz. for each adult sheep.

PLATE 19.—LAGUNARIA PATERSONII.

A Flowering Tree of Brisbane Botanic Gardens described in the December Journal.
Natural Order Malvaceæ (Mallow and Hibiscus Family).

THE FRUIT-GROWING INDUSTRY—III.

By ALBERT H. BENSON, M.R.A.C.

[*The concluding article of series, the first of which appeared in the November Journal, relating to marketing methods and problems and other matters of peculiar interest to Queensland fruitgrowers. The first article dealt with inter- and intra-State distribution; the second covered the possibility of developing oversea markets for fresh fruit; and in his concluding observations Mr. Benson reviews the various methods of fruit preservation and their applicability to Queensland products and conditions.*]

In the two previous articles I have confined my remarks to the marketing and distribution of fresh fruit. I now propose to deal with the question of storing fresh fruit when markets are over-supplied, and holding it for price improvement.

Fruit storage, obviously, relieves glutted markets, prolongs seasonal periods, stimulates demand, and increases consumption. As is well known, heat hastens the ripening of all kinds of fruit and cold retards it. It is, therefore, possible to store fresh fruit for a considerable length of time without deterioration, provided it is kept at a temperature that will suspend the ripening process. Different fruits require different temperatures. The hardier varieties of the temperate zone continue their development at a much lower temperature than tropical or sub-tropical products; in fact, firm varieties of apples and pears keep best at a temperature just above that at which they would freeze, whereas tropical fruit, such as the banana, develops (ripens) very slowly at 55 degrees F. Pineapples turn black at a temperature just above freezing point. Exact temperatures at which tropical and sub-tropical products may be stored are not definitely known, and experiments are now being conducted by the Queensland Department of Agriculture for the purpose of improving our present knowledge.

Many erroneous ideas exist as to the value of cool storage of fruit, one of the commonest being that any kind of fruit may be stored successfully, provided the temperature is right. No greater mistake could be made, as cool storage simply retards ripening, and once fruit is removed from store and placed under normal conditions it ripens very rapidly, and, if a quickly perishable product, soon decays. If it is of a long-keeping variety, its ripening proceeds much more slowly, and it can be retained for ample time to allow of its being retailed without appreciable loss. Cool storage merely retards development, and the fruit comes out practically in the same condition as when stored. The ripening process, which was suspended during the storage period, is resumed immediately on its return to ordinary conditions. It will, therefore, be seen that it is imperative to store only such fruit as may be held some time after release from the cool store; and it will not pay to store fruit that must be consumed immediately it is removed from store. Further, as cool storage costs something like 3d. per bushel case per week, it will not pay to hold inferior fruit. Only the very best, if stored for any length of time, may be profitably quitted.

As fruit does not develop or mature whilst in the cool store, it is essential for it to be fully developed, but not fully matured, before it is gathered, as immature fruit will remain unchanged in condition, and after release will not develop or ripen properly. Fully developed fruit will ripen when restored to normal conditions.

Fruit for cool storage should be perfect, consequently it should be handled, graded, and packed with the greatest possible care. Blemishes on fruit are intensified when the product is taken out of store and allowed to ripen. Selection is, therefore, limited to sorts that are good keepers and not easily bruised or otherwise blemished, such as firm-fleshed plums, apples, pears, clingstone peaches, grapes, and citrus varieties from which excessive skin moisture has been removed. Tropical fruits, such as unblemished pineapples and bananas, may also be successfully treated.

It will indubitably pay to store suitable temperate fruits for local consumption, but it is very doubtful if the storage of tropical fruits would prove equally profitable, except for such time as they may be in the cool store during transit to distant markets.

Many of the temperate fruits grown in this State are unsuitable for cool storage, as their edible condition is of comparatively short duration. They are soft, easily bruised, and rapidly rot if an attempt is made to keep them for any length of time. Generally they are fit only for immediate consumption, and this fact naturally limits their profitable production to the quantity that can be consumed during a limited period. The production, therefore, of such fruit, except in such quantities as available markets can absorb, is not recommended.

Having dealt with the markets for fresh fruit, we now come to the question of the best methods of preserving fruit for export. I do not purpose going into this

matter in detail, as it is a very wide subject and one more fitted for a text-book than a journal contribution; at the same time, as there is a very great deal of misunderstanding regarding fruit preservation, I think the following remarks will be useful to our growers:—

In the first place it must be clearly understood that only certain fruits, possessing specific qualities, can be preserved commercially; that is to say, profitably; though many other fruits not so suitable commercially, and which would not pay to preserve for the open market, can be preserved for home use. Several methods of commercially preserving fruit are in every-day use, and in order to be as brief as possible it is best to treat each separately and to see exactly what class of fruit is best adapted to each particular process.

1. *Drying Fruit.*—As the name implies, this method of preservation is simply the removal of superfluous moisture in fruit until the product is dry enough to keep without either fermenting or becoming mouldy. The drying is done either by exposing the fruit to the direct heat of the sun or by placing it in artificial driers, of which there are many types known as "Fruit Driers," "Evaporators," or "Dehydrators." The principle involved in all artificial methods of drying is the same, viz.:—The extraction of superfluous moisture from fruit by means of heat, which is generated in various ways and is applied to the fruit in the form of hot air.

Many kinds of artificial driers are now in use, some of which are very simple in their construction, whereas in others, such as up-to-date dehydrators, the hot air is under absolute control and the cost of treating the fruit is reduced to a minimum. There is a general want of knowledge amongst our fruitgrowers and others regarding the class of fruit that is most suitable for drying, many persons apparently thinking, if one can judge from the recent expressions of opinion that have appeared in the public Press on the subject of "Dehydration," that any kind of fruit can be treated successfully, and that, therefore, drying, or dehydration, as it is now called, will prove the means by which our surplus fruit can be utilised to advantage. I am sorry to say that I cannot agree with this opinion, as much of the fruit grown in Queensland is by no means suitable for drying, as, if so treated, it could not be converted into a marketable article that would realise a price high enough to pay the cost of manufacture.

In order to produce a high-class dried article, and there is no market for anything else, it is necessary to select fruits having high sugar content and firm flesh, that will dry heavy, for if the fruit to be treated is deficient in sugar, the dried product will be deficient in quantity and poor in quality.

Fresh fruit consists mainly of water containing a variable amount of sugar in solution, fibre, pectine or fruit jelly, and ash, and when the water is extracted only the sugar, fibre, pectine, and ash are left. If there is a deficiency of sugar or pectine in the fresh fruit, the dried product is of very little value, as it will consist largely of skin and fibre. In order to produce fruits, such as peaches, apricots, figs, raisins, grapes, sultanas, currants, or dates suitable for drying, they must be grown in a hot, dry climate, as sun heat is necessary to produce the sugar. It is for this reason that hot and dry districts, such as Mildura, California, Smyrna, Arabia, and Northern Africa have proved so suitable for the production of commercial lines of dried fruit. Prunes and drying plums can be grown in cooler climates, but even these fruits are richer in sugar and dry heavier when grown in a district having a hot, dry summer and an abundance of sunshine.

Apples of firm texture grown in cool climates, however, dry well, and ripe bananas may be converted into an excellent dried product known as banana figs, while the green fruit, when dried and ground, makes an excellent flour.

Regarding individual fruits, peaches must be rich in sugar and possess a solid, firm flesh. Yellow-flushed freestone varieties are the best. Apricots must be rich in sugar, the flesh firm and of a good deep colour, and free from fibre. Figs—only very rich, sweet, red-fleshed white varieties produce a first-class dried article, such as the so-called Turkish fig of commerce, which is produced mainly in Smyrna, and latterly in both California and South Australia, under dry and hot conditions. Only certain varieties of grapes are suitable for the manufacture of raisins, sultanas, and currants, and they should be grown under hot and dry conditions, as they must be very high in sugar and allowed to become dead ripe if a good marketable product is required. As regards dates, this fruit is only grown to perfection in very hot and dry districts.

It will thus be seen that as far as this State is concerned there is no great chance of our competing successfully in the open markets with most dried fruits, as the climate of our principal fruit-producing districts is not as suitable for the production of fruits suitable for drying as other parts of the Commonwealth, and we would, therefore, be under a great disadvantage when competing with more favoured districts. Apples can be dried for home and local consumption, but as it takes 8 lb. of a good

drying variety to 1 lb. of dried fruit, which, as it is only worth, at the outside, one shilling, it does not leave a very big margin for the fresh fruit.

The question of drying pineapples has recently been given a large amount of attention, and it is to be hoped that it will prove a successful means of utilising this fruit. It is, however, a new industry, and a market will have to be made for the product, as it is practically unknown at present.

Since writing the preceding paragraph, confirmatory evidence of same has been received from the Queensland Agent-General in London, who states, when referring to a market for dehydrated pineapples, that "the London experience does not appear to be very encouraging," and backs this statement up by giving the following advice:—"It is believed that until the market is established, low prices would rule; consequently it is not advisable to send more than 5 tons for a beginning."

2. *Canning Fruit.*—The success of canning fruits depends on the sterilization of suitable varieties of fresh fruits by means of boiling water or syrup, and hermetically sealing such fruit. In commercial canning, the fruit, after being properly prepared, is placed in suitable cans, which are then passed through the exhaust, on emerging from which the syrup is added, the lid of the can put on, and the cooking completed. Fruit so treated keeps indefinitely, provided it has been thoroughly sterilized and the can is hermetically sealed.

The cost of canning is such that only high-class fruit will now pay to handle, and at present practically the only fruit we have in sufficient quantity to keep a cannery running is the pineapple. With regard to this fruit, we have proved that Queensland can put up a very high-class article, provided necessary care and attention is given to its preparation.

The Stanthorpe District is capable of producing a high-class yellow-fleshed clingstone peach that is in every way suitable for canning, as we can get the size, colour, and firmness of fruit required for a first-class canned article. Recently a large number of suitable canning varieties have been planted, and these will be coming into profit shortly. High-class plums suitable for canning can also be produced, but so far the price realised for the fresh fruit prevents its being used for canning. The same remark applies to canning pears, such as the "Bartlett," and to apricots suitable for canning.

3. *Jam Making.*—Any good, sound, firm-fleshed temperate fruits, and all berries can be converted into jam, but watery, soft-fleshed fruits with a low sugar-content are not suitable. Apricots, all kinds of European plums, cherry plums, strawberries, cape gooseberries, and pineapples sell readily when made into jam, and there is a fair local demand for fig jam, and peach jam made from good, firm, yellow-fleshed fruit, but little demand for these jams for export, or for jams made from melons, apples, and other varieties of fruit, excepting a high-class apple jelly.

Good marmalade meets with a fair local demand, and I am of opinion that it is possible to build up a good oversea trade for this preserve.

4. *Pulping.*—This is a means of storing jam fruits during the height of a season, and holding them for final treatment until an opportunity for converting them into jam occurs. Only first-class jam fruits will pay to pulp, as there is no demand for inferior pulp, such as that made from watery peaches, nectarines, or Japanese plums, and it is only wasting time and money to put it up. Pulping consists of sterilizing the fresh fruit by boiling and storing it in hermetically-sealed tins till it is required for use.

5. *Candying and Crystllising.*—The Queensland climate lends itself to these methods of fruit preservation, and I believe that a profitable trade could be worked up by an energetic firm specialising in this line. We have proved that we can turn out candied peel equal to, if not better than, any produced elsewhere, and there is, therefore, no reason why we should not specialise in glace and crystalised fruits, for which there is a world's market.

6. *Cider.*—There is no reason why good cider should not be made in Queensland under artificial conditions, as it will be necessary to provide cool rooms in which to ferment the must. Even so, the cost of manufacture should not be excessive, and it would provide a market for a large quantity of fruit that would otherwise go to waste.

7. *Sterilized Fruit Juice.*—The sterilization of various fruit juices, such as pine-apple juice and grape juice, and placing them on the market as temperance drinks, is another neglected branch of our fruit industry, but one that has become of very great importance in the United States since that country went "dry." It is an industry that should pay well here, as there should be a good demand for pure fruit juice, both for cooking and as a beverage. For the latter it would certainly be preferable and infinitely more wholesome than the majority of the so-called soft drinks now so largely consumed.

In this series of articles I have endeavoured to show the class of fruits to which our growers should confine their attention, how to obtain markets for such fruit in the fresh state, and the class of fruit that can be utilised by drying or otherwise preserving. In conclusion, I submit the following suggestions for the careful consideration of all growers:—

1. Only grow such varieties of fruit as your soil and climate is best suited for.
2. Grow only first-class fruit that can be used not solely for the fresh fruit trade, but that will keep and carry well and may be canned, dried, or otherwise preserved. Do not grow rubbish.
3. Handle your fruit carefully, grade it properly, and pack it honestly.
4. Encourage the consumption of fruit in every way you can by advertising its value as a food and as Nature's greatest gift to man for the preservation of his health. See that it forms a part of every meal, and is always present on every hotel dining table, either in the fresh or preserved form. Get everyone to eat fruit; and instead of over-producing fruit you will have to increase the size of your orchard to meet the demand.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1921.	Nov., 1920.		Nov.	No. of Years' Records.	Nov., 1921.	Nov., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	2·15	20	Nil	0·59	Nambour	3·85	25	3·98	6·57
Cairns	4·16	39	2·80	4·66	Nanango	2·61	39	1·09	3·05
Cardwell	4·21	49	0·42	2·87	Rockhampton ...	2·17	34	1·93	3·21
Cooktown	2·80	45	0·80	0·97	Woodford	3·18	34	3·56	6·25
Herberton	2·43	34	0·10	0·85					
Ingham	3·96	29	0·54	2·27					
Innisfail	6·48	40	0·89	4·89					
Mossman	4·80	13	1·12	4·18	*Darling Downs.*				
Townsville	1·88	50	0·01	0·73					
					Dalby	2·53	51	1·74	1·62
Central Coast.					Emu Vale	2·59	25	2·06	3·91
					Jimbour	2·38	33	1·79	2·18
Ayr	1·79	34	0·14	1·81	Miles	2·52	36	1·14	1·38
Bowen	1·34	50	Nil	1·15	Stanthorpe ...	2·72	48	2·24	2·19
Charters Towers ...	1·62	39	Nil	0·15	Toowoomba ...	3·30	49	1·34	6·06
Mackay	2·91	50	1·46	1·92	Warwick	2·57	34	3·36	2·76
Proserpine	3·14	18	0·94	1·46					
St. Lawrence ...	2·38	50	0·53	1·48					
					Maranoa.				
South Coast.									
					Roma	2·07	47	1·12	0·99
Biggenden	2·72	22	2·42	2·56					
Bundaberg	2·63	38	1·68	2·17	*State Farms, &c.*				
Brisbane	3·69	70	3·24	6·28					
Childers	2·79	26	3·24	2·29	Bungeworgorai ...	1·99	7	1·77	0·76
Crohamhurst ...	4·39	30	2·76	5·54	Gatton College ...	2·70	22	0·48	3·38
Esk	3·18	34	1·53	5·10	Gindie	2·12	22	0·05	0·85
Gayndah	2·83	50	1·38	2·59	Hermitage ...	2·59	15	2·81	3·89
Gympie	3·16	51	3·01	4·56	Kairi	2·44	7	0·07	1·18
Glasshouse M'tains	3·77	13	3·48	5·62	Sugar Experiment				
Kilkivan	2·57	42	2·96	5·77	Station, Mackay	2·68	24	1·32	2·33
Maryborough ...	3·10	50	3·32	2·58	Warren	3·29	7	4·30	3·85

NOTE.—The averages have been compiled from official data during the periods indicated; but the totas for November this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Editorial Notes.

Australia's Future.

The timely and optimistic note struck by Sir Denison Miller, Governor of the Commonwealth Bank, at a large gathering of financial men and journalists in Sydney recently, reminds us that citizenship of the Commonwealth is a privilege that cannot be lightly regarded. Of all the nations drawn into the vortex of the great war, Australia, perhaps, proved the most buoyant, and the remarkable figures quoted by Sir Denison Miller may be accepted as an index of Australia's great wealth, and, if given elbow room, a basis upon which to build a reliable forecast of a glittering future. During the war and pooling periods Australia sold to the Imperial authorities wool to the value of £175,667,000; meat, from Queensland and New South Wales, £10,309,000; butter and rabbits, £21,115,000; wheat (including flour in wheat equivalent), £51,000,000; and metals, £41,000,000. Australians have invested £270,000,000 in Commonwealth loans, £163,000,000 in State loans, and £153,000,000 amongst 3,256,319 depositors in the savings banks, making a grand total of nearly £741,000,000 invested. Over 1,000,000 heads of families own and live in their own homes. The number of sheep, cattle, and other live stock is sufficient for many more millions of people than the country at present carries, and in one State alone there is sufficient coal to last, at the present rate of consumption, for 10,500 years. In addition, there are unbounded supplies of minerals to be mined. If secured from external aggression and standing on the two legs of primary and secondary industry, with broad acres of virgin soil as the base of one and unlimited raw material of the other, Australia with Time on her side has a future the greatness which is but mistily perceived. Australians, 98 per cent. of whom are of pure British stock, have in their great White Continent one of the finest countries in the world, with illimitable resources and millions of acres of Crown lands suitable for settlement and development, and there is room for many millions more to share their shining heritage.

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The Butter Position.

The present unsatisfactory condition of the butter market is due to a large extent to unnatural restriction of trade brought about by a continuance of the operation of war measures long after their necessity had ceased to exist. As the result of rigid rationing of butter in the United Kingdom there are now vast cold storage accumulations. The rationing was at such a rate that reduction of accumulated supplies became a very slow process, the channels of distribution were blocked, and newer consignments could not be cleared as they came to hand. A general decline in values followed, and the Imperial authorities in their wisdom did not deem it fit to quit stocks quickly and so make the first loss the least. Through their retention of the produce the market has become practically only a receiving one. As well as the consequent disorganisation of the industry, there is the fact that margarine manufacturers have been given another opportunity to popularise their product. When it became known here that it was the intention of the Imperial Government to immediately release stocks held in storage, an effort was made by those associated with the industry in Australia to persuade London to unload gradually, and therefore avoid a rapid declension in values and the grave possibility of reducing the industry to chaos. To this overture the Imperial people have made a definite proposition, but it is understood that, so far, the butter held by them has not been quitted. The market has become very appreciably affected in consequence, and at present it is hard to say what is the value of butter. It is significant that Tooley street has reduced the amount of the advance on surplus butter by about 2d. per lb. One possible way out of the difficulty is for the associated companies concerned to set up an intelligence section to ascertain what markets are available in all butter-consuming countries and offering the best opening for disposal. The present position could have been obviated to a large extent by releasing butter from store more quickly when consumers were clamouring for it. As it is, vendors are faced with the problem of selling two seasons' produce in one. The existing difficulty is probably only a temporary kink in market organisation, and is paralleled in the Japanese silk trade when, recently, over-production was followed by a slump due to an effort to dispose of the product of two years' manufacture for one year's use of material. But at the back of the butter position is the minor menace of margarine, the manufacture of which increased to an enormous extent—as much as 10,000 tons per week—during the war.

A Butter Pool.

Among Queensland butter producers there is a pronounced feeling in favour of the creation of a butter pool, and the Queensland Co-operative Dairy Companies' Association is taking the matter energetically in hand. The slump in butter and the uncertain conditions that have ruled in respect to export since the return to open marketing has directed the minds of manufacturers to the desirability, if not the necessity, for complete co-operation and co-ordination in marketing, both locally and overseas. In Victoria, where there was a rush for open-market conditions upon the termination of the Imperial purchase contract, and marked opposition to joining in with Queensland and New South Wales in the winter pool, producers now realise that they have lost thousands of pounds by standing out. The result is there appears to be a sharp revulsion of feeling in favour of constituting an all-embracing pool on co-operative lines.

General Notes.

A NEW WHEAT DISEASE.

In the course of a lecture delivered by Mr. F. F. Coleman, Expert under the Pure Seeds Acts, before the Toowoomba Chamber of Commerce recently, reference was made to the discovery of what appears to be a new wheat disease. The appearance of discolouration on the basal nodes and internodes of some wheat growing on the Downs led to a close investigation of the cause.

Specimens of affected wheat stalks, with grain attached, were procured and submitted to Mr. Henry Tryon, Entomologist-in-Chief, who, after obtaining and examining further specimens, advised that the symptoms of "disease" occurrence were due to the attacks of a minute mite that apparently establishes itself, in the first instance, in the sheathing base (or leaf sheaf) of the flag, and thence effects an entrance into the substance of the straw, especially in the neighbourhood of the node, where leaf-sheaf and culm unite. This disease has not previously been reported as associated with the wheat plant in Australia. The discovery shows that the customary precautions in examining seed wheat destined for agricultural areas are fully justified, and is an instance of the value of the work accomplished by lesser-known sections of the Department of Agriculture and Stock.

[Mr. Tryon informs us that this Acarus is a *Tarsonymus* comparable with the species noted by Reuter as injuring wheat in Finland.—Ed.]

PUBLICATIONS RECEIVED.

The Agricultural Gazette of Canada (Nov.-Dec., 1921), has among its leading topics an article descriptive of the efforts of the Dominion Live Stock Branch for the improvement of Canada's herds and flocks. Very practical assistance is given to farmers who, under the "Car Lot Policy," are paid reasonable travelling expenses to central stock sales for the purpose of purchasing stock for return to country points. In Eastern Canada the assistance is restricted to the purchase of female breeding stock—cattle, sheep, or pigs. In Western Canada the policy covers stores in addition to breeders. Purchasers are required to fulfill certain conditions in connection with their truckings and to give satisfactory assurance that none of the stock is purchased for speculative purposes. It is claimed that this policy has proved very valuable educationally, and not expensive. The cost of cattle shipped under its terms in the course of a triennial period averaged only 59 cents per head. Sheep in the same period averaged only 18½ cents per head. "The Free Freight Policy" is another scheme to assist the small stockowner. It was designed to prevent as far as possible the slaughter or exportation of useful heifers, young ewes, and young sows offered for sale on the open market at the central stockyards. Under this policy farmers are entitled to truck from saleyards to country points female breeding stock of the classes mentioned, freight free, provided the stock was not purchased for speculative purposes. "Cow Testing, 1920," is another contribution illuminative of progressive Canadian methods of herd improvement. An account of the organization of Alberta potato growers is also interesting to Queensland co-operators.

The New Zealand Journal of Agriculture (Dec., 1921), contains in "The Grasslands of New Zealand," an account of the application of the principles of pasture establishment. Other informative features are continued notes on commercial potato-growing, and account of sugar-beet trials and analyses, and notes on lucerne experiments at Ashburton, with special bearing on the fertilizer question.

The Canterbury Agricultural College Magazine (N.Z.) (Dec. 1921), is a bright production, containing an account of the student's doings. In an editorial it asks: "What are our ideals? To some this may be a startling question. The absorbing interests of our material, practical life are apt to crowd out and banish from our minds the question of our purpose and place in the community. But, however busy we are, and however little thought we give to it, one thing stands out clearly: We may not give verbal expression to our thoughts and ideals, but we 'live'—and by our lives we express our ideals."

The Journal of the Department of Agriculture of South Australia (Dec. 1921), has among its main topics an important paper on "Forage Poisoning" by Lionel B. Bull, D.V. Sc.

The Journal of Economic Entomology (U.S.A.) for June, 1921, devotes much space to the efficiency of grasshopper baits.

Dates and Date Cultivation of 'Iraq, parts I. and II., Memoir III., Agricultural Directorate, Ministry of Interior, Mesopotamia, by V. H. W. Dowson, is an account of the results of an investigation into the yield of date palms on the Shat Al 'Arab.

PREPARATION OF COTTON SEED FOR PLANTING.

Mr. W. H. Drummond (Springsure) writes:—

"I have planted 11 acres of cotton. . . . It is doing well, and I intend to plant a further 4 acres.

"For planting I used a maize drill, and found it a complete success, but only by the method I used. My method is as follows:—Boil 2 pints of flour in 4 gallons of water, place the cotton seed in this solution, squeeze or drain it, and then roll the seed in dry ashes, using an old washing tub for this purpose; then sift through a wire screen to separate matted seed; then spread out to dry. I found that by preparing the seed in this way it worked in the drill as easily as maize. I planted 4 acres a day as well as preparing the seed. Ashes and sand were tried by themselves, but this proved unsatisfactory. I found 4 gallons of boiled flour quite sufficient for the 11 acres."

Answers to Correspondents.

WORMS IN HORSES.

"INQUIRER" (Murgon)—

The Government Veterinary Surgeon, Mr. A. H. Cory, M.R.C.V.S., recommends the following treatment for worms in horses:—

"The horse should be stabled overnight and fasted. In the morning a drench containing 2 oz. of turpentine and 1 pint of raw linseed oil should be given (slowly and carefully). If the horse attempts to cough, lower his head immediately.

"The following powder will also be found beneficial if given in the morning in a bran mash or some damp food:—

Santonin	15 grains
Sulphate of iron	1 drachm
Gentian	4 drachms

"After three weeks' or a month's interval, the first drench can be repeated if thought necessary."

ZAMIA.

P.J.—The Government Botanist, Mr. C. T. White, F.L.S., advises:—

"(1.) All members of the Zamia family (*Cycadaceæ*) are reputed to be poisonous to stock.

"(2.) All parts of the plants, with the exception of the core or pith, are reputed to be poisonous. The disease known as 'ricketts' has been induced by experimentally feeding the leaves to stock, but the seeds are generally looked upon as being more poisonous.

"(3.) Eradication in the taller-growing species, such as *Cycas media*, consists of cutting the stem down (it never shoots again), or a notch is cut in and an arsenical solution or other poison poured in. In the stemless species, such as the wild pineapple (*Macrozamia spiralis*) eradication is effected by driving an iron spike into the crown and working it backwards and forwards so as to damage the 'bulb' below, and to make the destruction quicker and surer an arsenical solution may be poured in. Where the plants are few in number they may be grubbed out.

"(4.) *Treatment of Affected Stock.*—Little can be done in this direction. The Chief Inspector of Stock, Major A. J. Cory, M.R.C.V.S., has recommended the following:—'The first action to be taken is to prevent the animals gaining access to the plant, and a purgative should be given to the affected animals, consisting of ¾ to 1 lb. of Epsom salts in 3 pints of water, as a drench. After the drench has worked, the animals should be given the following powder, either mixed in food or in a pint of cold water:—

Potassium iodide	2 drachms
Powdered nux vomica	1 drachm
Powdered gentian	4 drachms

"(5.) *Uses.*—In Western Australia the core of the stem or bulb has been used as a stock food with a certain amount of success, the pith being grated or ground up and boiled in about twice its weight in water. As the solution cools it becomes thick and jelly-like, and is said to be useful as a food for pigs, poultry, and hand-fed calves, the poisonous principle in the stem being rapidly removed by heat. The pith has also been spoken of favourably as a source of industrial alcohol."

POP CORN.

"Farmer," Mount Kent, Nobby.—The Director of Agriculture (Mr. H. C. Quodling) advises you as follows:—

"Climatic conditions and class of soil necessary for the successful production of maize are equally suited to the needs of pop corn, and land intended for its growth should receive the same careful preliminary cultivation.

"Sowings may be made from August, or as soon as all danger from frost is over, to early in January, in drills spaced 3 ft. apart, distributing the seed thinly, in order that the plants may be from 12 to 16 in. apart in the rows. Three to four pounds of seed are sufficient to sow 1 acre.

"Careful and frequent inter-row cultivation should be carried out, once the plant is above the surface and the rows can be distinctly defined, in order to keep down weed growths and prevent evaporation of soil moisture.

"Pop corn does not grow to the same height as that reached by larger-grained varieties, but carries a greater quantity of lower leaves, and, under favourable conditions, two and sometimes three cobs are produced on the one plant.

"The ear of pop corn, being smaller in diameter than that of ordinary corn, some adjustment of the corn sheller is necessary when threshing.

"Owing to the smallness of the grain, it will be found that greater efficiency is obtained and less waste occurs when the ear is husked prior to shelling. In using the husker and sheller, unless the riddles are of a large capacity, considerable grain is apt to be carried out, with the husk, especially when the machine is being run to its full capacity.

"Two of the most suitable varieties for Queensland conditions are white rice and golden tom thumb."

LANTANA POISONING.

S.F.S.P. (Gordonvale).—

1. There is no known method of dealing with lantana poisoning in horses.
2. There is no satisfactory remedy for lantana poisoning in cattle. Most cattlemen administer a strong purgative.
3. Get rid of the lantana.

PISÉ CONSTRUCTION.

A.M. (Mackay).—Mr. Morry, the departmental surveyor, to whom your inquiry was referred, advises as follows:—

"Adobe blocks should not be more than 12 in. by 6 in. wide and 6 in deep. The time they would take to dry would depend on the weather, but with good drying conditions they should be fit to use in two weeks. No foundations other than the natural earth are required for pisé buildings, as stated in the specifications published in the Journal. The only mortar used is mud of the same material, freed from stones by running through a sieve while in a liquid state. It will afterwards thicken like putty and will then be fit to use."

J.E. (Moola).—

Your house has stood pretty well, considering the way in which it was built. Had wire netting been used on the saplings, the mud plaster would not have fallen off. If possible, even now wire netting should be put on in small patches where necessary, then plastered over with mud and thickened with some fibrous material. If netting cannot be used, drive nails into the saplings, then plaster as before. These will hold the plaster when patching is completed. Give it all, inside and out, two good coats of limewash.

WATERCOURSE BOUNDARY.

A.G.N. (Howard).—

The ordinary water line on each bank of the creek is the boundary of the properties on the frontage, consequently a property cannot be held to be completely enclosed unless fenced along the creek. Information *re* impounding laws can be obtained from your local shire clerk or at the nearest C.P.S. office.

ALGAROBA AND CAROB BEAN SEED.

Supplies are expected from overseas. In the meantime applications for seed are being registered.

SWAMP GRASS (*POA AQUATICA*).

E.M. and other Inquirers.—

The Farmers' Co-operative Distributing Coy., Brisbane, are selling agents for this grass, and are prepared to supply roots at 45s. per bag f.o.b. Brisbane. This grass does not seed too readily, and is propagated usually by division of the roots.

GREEN SPOTS IN CHEESE.

W.P. (Nigger Creek, *viâ* Herberton).—The Chief Dairy Expert, Mr. E. Graham, advises as follows:—

"Green spots in cheese are attributable to the growth of pigmentary moulds. It is possible that the milk from which the cheese is made, or the cheese itself, may be affected with the mould. Generally, moulds of this class grow profusely on wood which is in a state of decay, and the organism is transferred from the decaying wood to the milk or the newly made cheese per medium of the atmosphere. It is possible to prevent the growth of mould injuring the cheese. Foremost, it must be remembered that moulds for their growth require both moisture and oxygen, and, provided that the rind of the cheese is firm and unbroken, it is then impossible for the mould growth to penetrate beyond the rind of the cheese, and when restricted in this way the quality of the cheese is not appreciably interfered with. It is only when the mould is able to penetrate into the cracks or crevices in the cheese that material damage to the quality of the cheese results. In toasting the surface of the cheese, the exterior of the face becomes sealed as a result, and it is then found that the mould growth is capable of doing little damage, and there is no doubt that if the outer lines of the cheese can be kept intact in the process of manufacture it will be found similarly impervious to mould growth, as the rind of the cheese readily dries out and fails to supply an adequate amount of moisture to permit of the serious growth of mould. Even if mould does attach itself to the exterior surface of the cheese, it may readily be removed by wiping the cheese over with a piece of clean hessian or other rough cloth."

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

The excellent rains recently experienced should have a heartening effect on all farming operations, as a good season is assured.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing, providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production. Weather conditions, particularly the recent heavy and continuous rains, have interfered a great deal with farming operations. Although abundant supplies of grasses are in evidence, provision should be made for the inevitable period, at maturity, when these lose their succulence.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description suitable for coastal districts and localities, where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to planters' friend (so-called imphee) and to orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a denseness of growth, which in itself is sufficient to counteract to some extent the effect of frost.

In the majority of agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of one pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for our hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COAST DISTRICTS

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smoothleaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery

with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can, but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground, but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries can be planted towards the end of the month, and, if early-ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing, is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a manner that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit-fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least, before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts, winemaking will be in progress. Here, again, care is necessary, as the better the condition in which the fruit can be brought to the press the better the chance of producing a high-class wine.

Where necessary, citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·0	6·51	5·24	6·46	5·45	6·25
2	5·1	6·51	5·25	6·46	5·45	6·24
3	5·1	6·51	5·26	6·45	5·46	6·23
4	5·2	6·51	5·27	6·45	5·46	6·22
5	5·3	6·52	5·28	6·44	5·47	6·20
6	5·4	6·52	5·28	6·43	5·48	6·19
7	5·4	6·52	5·29	6·42	5·49	6·18
8	5·5	6·52	5·30	6·42	5·50	6·17
9	5·6	6·52	5·31	6·41	5·50	6·16
10	5·6	6·52	5·31	6·41	5·51	6·15
11	5·7	6·52	5·32	6·40	5·51	6·14
12	5·8	6·52	5·33	6·39	5·52	6·13
13	5·9	6·52	5·34	6·38	5·52	6·12
14	5·9	6·52	5·35	6·38	5·53	6·11
15	5·10	6·52	5·35	6·37	5·53	6·9
16	5·11	6·52	5·36	6·36	5·54	6·8
17	5·12	6·52	5·37	6·35	5·54	6·7
18	5·12	6·52	5·38	6·34	5·55	6·6
19	5·13	6·52	5·38	6·34	5·55	6·5
20	5·14	6·52	5·39	6·33	5·56	6·4
21	5·15	6·51	5·39	6·32	5·56	6·3
22	5·16	6·51	5·40	6·31	5·57	6·2
23	5·17	6·51	5·40	6·31	5·57	6·1
24	5·18	6·50	5·41	6·30	5·58	5·59
25	5·19	6·50	5·41	6·29	5·58	5·58
26	5·19	6·50	5·42	6·28	5·59	5·57
27	5·20	6·49	5·43	6·27	6·0	5·56
28	5·21	6·49	5·44	6·26	6·0	5·55
29	5·22	6·48	...	...	6·1	5·54
30	5·23	6·48	...	...	6·1	5·53
31	5·23	6·47	...	...	6·2	5·52

PHASES OF THE MOON, ECLIPSES, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when summer time is not in force.

			H. M.	
6 January	☾	First Quarter	8 24	p.m.
14 „	○	Full Moon	12 37	a.m.
20 „	☽	Last Quarter	4 0	p.m.
28 „	●	New Moon	9 48	a.m.

Apogee on 3rd at 8·54 a.m.
„ on 30th at 10·24 p.m.
Perigee on 15th at 9·48 a.m.

5 February	☾	First Quarter	2 52	p.m.
12 „	○	Full Moon	11 18	a.m.
19 „	☽	Last Quarter	4 18	a.m.
27 „	●	New Moon	4 48	a.m.

Perigee on 12th at 9·0 p.m.
Apogee on 27th at 12·48 a.m.

7 March	☾	First Quarter	5 22	a.m.
13 „	○	Full Moon	9 14	p.m.
20 „	☽	Last Quarter	6 43	p.m.
28 „	●	New Moon	11 3	p.m.

Perigee on 13th at 9·30 a.m.
Apogee on 26th at 5·36 a.m.

The splendid phenomenon of an annular or ring-shaped eclipse of the sun will be seen, if clouds do not intervene, in North Africa (including part of the Suez Canal) and in South America on 27th and 28th March.

The only other eclipse of the year will be the Great Australian Total Eclipse of the Sun on 21st September, of which special particulars will be given.

The apparent proximity of the moon and Delta Tauri early in the evening of 9th January will be of interest to those who possess telescopes or binoculars, also the occultation of Omicron Leonis on the 16th, about 1 o'clock in the morning. On 7th February Delta Tauri will be occulted by the moon about 4 o'clock in the morning, also another small star in the same constellation half an hour later, followed by another within three quarters of an hour after that.

The occultation of Jupiter by the moon on 16th February will unfortunately occur about sunrise at Brisbane, but may be observable at Oontoo, Birdsville, and other places in the far south-west.

The planet Jupiter will be coming into view before midnight in February and March; Venus will pass from west to east of the sun on 9th February; and Mercury from east to west on the 14th. Before the end of March Jupiter and Saturn will be prominent evening stars.

On 21st March the sun will rise almost exactly due east, and set due west, passing from south to north of the equator.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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PRINCIPLES OF STOCKFEEDING.—II.

HOW THE ANIMAL USES ITS FEED.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College.

[*In the first article of this series, published in the December issue of the Journal, Mr. Potts described the constituents of stock feed and some of the fruits of the experience, ripened by the simple process of trial and error, of stock-raisers in older countries. In this and succeeding articles it is not proposed to go deeply into the science of feeding, but, rather, to employ the results of scientific research in an effort to show how stockfeeding may be made more profitable.*]

Having briefly examined the composition of feeds, and having indicated the special part played by each class of food-ingredient, it is necessary next to study somewhat in detail the uses to which an animal puts its food.

Perhaps we can arrive at a quicker and better understanding of this matter if, first, we put it down in table form and then proceed to describe each item of the table, thus:—

THE FOOD EATEN BY AN ANIMAL IS USED

(1) For maintaining life.	(2) For carrying out the process of digestion.	(3) For production.

Perhaps in actual practice there is no very clear line of division between these three sections. They overlap somewhat, and, generally, any feed eaten is used in the three ways. Still, the division is convenient. It is real, and a clear conception of each of these three uses for the feed is a sound foundation upon which to build up a proper system of profitable stockfeeding. Let us consider each section in detail.

(1.) *For Maintaining Life.*—If we consider a fully grown animal, say a bullock, and endeavour to keep him just as he is, in good, healthy condition, but neither gaining nor losing weight, nor doing any work, but just living, we would find it necessary to give him each day a certain amount of feed, taking into consideration both quantity and quality (*see* Principles of Stockfeeding—I.). This daily feed would be consumed, but the animal would show no response to it. He would be to-morrow just as he is to-day, or was yesterday. Without this feed he would waste away and eventually die. With this feed he is maintained as he is. Hence we know this as a "maintenance diet." If less than the maintenance diet is fed, the animal is on starvation rations and must of necessity fall away in condition. If more than the maintenance diet is fed, the animal can produce, as will be described later.

Just here there are several points which are of importance to note. First, we have the case of the young stock. From the very nature of things, young stock try to grow. To feed them a mere "maintenance diet" is not possible. Whatever feed they get, they try to convert some of it into increased body tissue and bone. If the feed is not sufficient in quantity and quality for both maintenance and growth, then neither function is carried out properly. In brief, the young animal becomes starved and stunted. If the shortage of feed is prolonged, the youngster gets a set-back from which it never recovers, while if too prolonged the youngster dies; and we know that young animals will die under conditions of feed which will keep mature animals alive and healthy.

Much the same can be said with regard to cows in milk. Here we have a female endeavouring to produce food for her young. Because of man's careful selection and breeding, however, the dairy cow can produce, and tries to produce, much more milk than is just sufficient to nourish her calf. Here, again, it is not possible to feed a mere maintenance diet. For, whatever feed is given to a cow in milk, some portion of it will be used to make milk, and the better the cow the greater the tendency for her to so use her feed. On a maintenance diet which would keep a bullock in idleness and in good condition, a milking cow would starve to death. How often we see good milch cows lean in condition! They may put on fat when nearly dried off. Further, under drought conditions the best cows are likely to die first.

There is yet a third point which might be mentioned here, though we shall have more to say about it later on. A maintenance diet merely keeps stock as they are. We naturally may ask the question: "Is it profitable to feed a mere maintenance diet?" Let us examine several cases. You might have a number of prime bullocks fit just at a time when the market temporarily is against you. Here it might well pay to feed a maintenance diet, merely for the purpose of holding the bullocks as they are. On the other hand, if you have stock which you have let get into low condition, say, because of drought, and then you begin to feed a maintenance diet in order to keep them alive, it certainly does not pay directly, though it may pay indirectly by holding your stock against the chance of favourable seasons. A little thought, however, will indicate that you may easily expend on feed for such impoverished stock an amount well in excess of their value, and at the end have the stock in the same starved condition as when you began.

With young stock and cows in milk, as has been pointed out, the feeding of a mere maintenance diet does not pay. In truth, with milch cows, the heavier the feeding, within the powers of the cow to produce, the cheaper the feeding. To put it crudely: Suppose it takes 15 lb. of feed for maintenance and each extra pound of feed will enable the cow to produce 3 lb. of milk, then we have the following:—

15 lb. of feed	..	animal kept alive and healthy; no milk
16 lb. of feed	..	animal kept alive and healthy; 3 lb. milk
17 lb. of feed	..	animal kept alive and healthy; 6 lb. milk
18 lb. of feed	..	animal kept alive and healthy; 9 lb. milk
25 lb. of feed	..	animal kept alive and healthy; 30 lb. milk

and it is quite within reason to anticipate that the 30 lb. of milk would more than pay for the 25 lb. of feed given; whereas, with no milk, the 15 lb. of feed is a dead loss.

Thus we see that in this matter of stockfeeding we must consider a portion of the food as being used merely to maintain life. Any feed in excess of this can be used for production. Again, it is quite just to consider the maintenance diet as giving no returns—as being a loss; while any excess feed, because it enables the animal to produce something, does give returns, and possibly profitable returns. In this we have something very similar to the efficiency of a machine. All the energy put into a machine does not come out as useful work. Part of the energy put in is used up in overcoming friction, and is generally referred to as lost energy. We have some considerable control over the amount of energy which may be lost in a machine. By careless oiling, bad adjustments, &c., we can easily increase the loss greatly, but with the greatest of care we cannot reduce the loss below a fairly definite quantity (about 40 per cent.). Is it the same with stockfeeding? Can we exercise any control over the amount of feed required for maintenance? Let us see.

We all know that animals maintain their bodies at some fairly definite temperature; for example, it is 98.4 deg. F. in the case of human beings, 101 deg. F. for cattle, 100 deg. F. for horses, 103 deg. F. for pigs, 107 deg. F. for poultry, &c. To maintain this temperature the animal has to generate an amount of heat inside its body. It does this by oxidising (burning) a portion of its feed as this is being conveyed throughout the body in the blood stream. This generation of body-heat is a normal function of animal life. A portion of the feed must be used for this purpose. Heat is generated and given off by the animal, whether the outside temperature is higher or lower than that of its body. But (and herein lies the important

point for us at this stage of our discussion) more heat, and therefore more of the feed, is required to keep up the body temperature if the stock are exposed to cold, wet, bleak conditions than is the case if they are well housed, or rugged, or well sheltered by trees, say, in the paddocks.

Again, animals are creatures of movement. They move themselves from place to place in search of food and water. They move their jaws in the process of feeding. They swish a tail or shake their skins to rid themselves of flies or other pests. They flicker an eyelid. In short, movement, whether deliberate or involuntary, is a normal state with animals. If they are "at rest," that is, not doing work, then these movements are for maintaining life. But as movement cannot take place without energy to force it, and as the energy in an animal is derived from its feed, so a certain amount of the feed eaten is utilised for the generation of the energy required for what might be called "maintenance movements." Obviously man can have a large control over much of this maintenance movement. If the stock have easy access to both feed and water, so that long travel from one to the other is avoided, movement in search of food can be reduced. In the same way, if the animals are kept under comfortable conditions—conditions which do not cause the beast to wander round aimlessly all night in search of shelter or all day in search of shade, or conditions which largely prevent the irritation by flies or mosquitoes or ticks or other irritants (there is a lot of truth in the phrase "to be worried to death," or, at any rate, to leanness)—then much energy, and consequently much maintenance feed, is saved. It must be remembered, however, that a certain amount of exercise is necessary for healthy life and development. Even when topping up a pig, exercise must not be prevented entirely.

There is yet a third demand for maintenance. We often say that a young animal grows; that it ceases to grow when mature; and that it declines or wastes away with age. This statement is not correct. Growth is a normal function of life, and continues until death. So is the wastage or decline. In young animals the tendency to grow exceeds the tendency to waste; so the animal increases in size and bulk. At maturity, growth and wastage balance one another as regards the actual animal body, though the animal can produce and the energy required for this production can be made good by extra feed. In old age, wastage exceeds the tendency to grow, and so there is a decline. Now this ever-present wastage—wastage of tissue, we term it—requires to be made good. It is a matter of maintenance, and a certain quantity, chiefly of protein matter, is required in the maintenance diet. We cannot exercise any great control over the amount of proteins required to repair the wastage necessary for maintenance.

Thus we see that an animal which is merely living, but neither working nor producing, required an amount of feed for maintenance which will supply:

(1.) Heat, to keep up body temperature;
(2.) Energy, to allow of necessary muscular action;
(3.) Proteins, to repair wastage of tissue.

Careful management can exercise considerable control over the first two, but not much over the third. Carbohydrates, fibre, and fats are chiefly concerned in supplying heat and energy, while the proteins of the feed (Stockfeeding—I.) are mainly responsible for repair of tissue. The discussion as to actual quantities must be deferred to a later article.

(2.) *For Carrying Out the Process of Digestion.*—Referring to our table at the commencement of this article, it will be seen that we have spent considerable space on the discussion of the "maintenance diet." This has been done because it is considered essential that a clear conception of what is meant by maintenance should be got before any idea of profitable feeding—that is, feeding for production—can be established. However, before we approach the production side of feeding, with its probability of profits, it is necessary to consider a subsection—namely, the feed required for the process of digestion.

In this discussion it is not necessary to go into the question of digestion in detail. All that is required is that you should understand one or two points. First.—A certain amount of muscular action is required to break the feed up into small particles and to pass it through the system. Second.—The feed, as it passes into the mouth, and thence to the stomach and on through the intestines, is flooded with various digestive juices. Just consider food as it goes into the mouth. It is chewed, ground up by the teeth, and at the same time it is wetted with saliva. A somewhat similar action takes place at each stage of the food's passage through the animal's system—that is, a certain amount of the feed has to be expended to generate the energy and create the gastric juices required for digestion. Here, again, we have a loss in feed-value. But it is a loss which cannot be eliminated. It can, however, be reduced to a minimum with careful management.

Thus, feeds which contain a large amount of indigestible fibre require more energy for digestion than feeds which are more highly concentrated. For example, hard, dry straw makes a bigger demand for digestive energy than bran, or grain, or green lucerne.

Again, an animal wastes much digestive energy if it becomes over-tired or exhausted. An animal suffering from fatigue does not assimilate its food easily.

But, perhaps, the main point to be considered with regard to this use of the feed is that of "vitamines." This introduces a new feature into our discussion. It can be treated only very briefly here. The term "vitamine" has been applied to certain chemical compounds which are present to greater or less extent in various feeds, but, even so, are present in very small quantities. The function of these vitamines is to make the feed ingredients more readily digestible. In practical feeding we can meet this requirement by using mixed feeds. Thus we find that a feed composed of a single crop—*e.g.*, a feed made up of maize silage, maize stover, and maize meal—is not so satisfactory as one composed of maize silage, oaten chaff, bran, and linseed meal, even though the analysis shows each feed mixture to contain the same quantities of digestible ingredients. In short, by mixing different crop products we are almost certain to bring in the necessary vitamines.

(3.) *For Production.*—This is the third use to which the animal puts its food. It is the important use as regards possible profits. Let us first summarise the different types of production:—

(*a*) An animal may be required to produce mechanical energy—*i.e.*, it is used for draught purposes or riding.

(*b*) An animal may be required to produce, merely by putting on fat, as when we are topping-up a pig for market.

(*c*) Another form of production is that of growth. This may be growth of body tissue, as with young animals, or it may be growth of wool. Included with this might be the production of milk.

(*d*) Still another form of production is the reproduction of the race. It is obvious that the female, when carrying the fœtus in the womb, is producing something. It is not so obvious, but it is nevertheless true, that the male is expending much energy when used at the stud.

All these various forms of production require a modification of the feed given, but all of them require feed in excess of the maintenance diet. This will be treated later.

Let me just finish this article by pointing out to you that the feed required for maintenance is a fairly constant quantity—that is, for any given breed or species, equal live weights require the same amount of feed (quantity and quality) to maintain themselves. If feed in excess of this is given, the animal can produce, but individual animals vary greatly in their power to produce. Some are efficient, and pay to feed. Others are inefficient, and are not payable.

Perhaps we can illustrate this best by considering a number of dairy cows. Suppose each cow weighed 1,000 lb. live weight, but that different cows varied in their power of milk production from 20 lb. per day up to 80 lb. per day. Further, suppose each beast fed to the limit of its production. To begin with, each cow would be debited with an equal amount for maintenance. Beyond this, each animal would have to be debited with its production feed. The least consideration (*see* table, p. 60) will show that the worst cow, the producer of 20 lb. of milk, has no chance to pick up her debit for maintenance. On the other hand, the best animal, the producer of 80 lb. of milk, may—in fact, will—pay to feed.

This leaves us, then, with one of the big fundamental facts of feeding: *It does not pay to feed indifferent producers. It does pay to feed high-class stock.*

DAIRY FODDER PLOTS.

By C. S. CLYDESDALE, Assistant Instructor in Agriculture.

The majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimban Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the Summer months.

No fertilisers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.—At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and, later on, in March was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

The plot at Nindooimbah was fallowed during the Summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.—The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of Winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disced" in, the cereals being sown on the disced surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early maturing varieties.

Description and Varieties on North Coast.—The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 ft. in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 ft. at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 ft. high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 ft. in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 ft. in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 ft. 6 in. in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 ft. in height.

PLATE 20.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 21.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

Plots at Nindooimbah.—Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

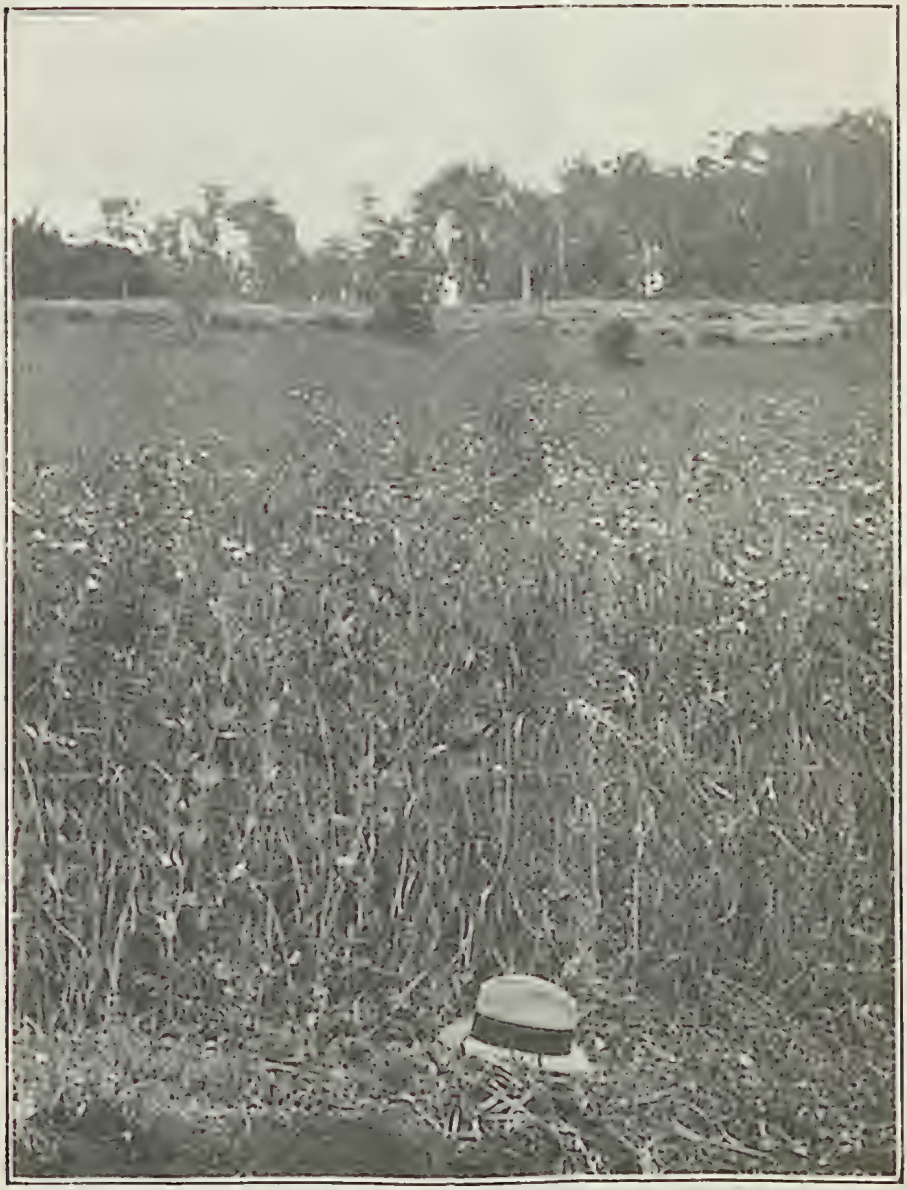


Plate 22.—Patriot Wheat and Field Peas at Mr. F. E. Burton's Farm Bridges, N. C. Line.

Skinless and Cape Barley.—During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

PLATE 23.—KUDZU VINE (FODDER PLANT), AT MR. H. M. McMARTIN'S FARM, PULLEN VALE.

Ruakura and Algerian Oats.—The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.—Owing to its early maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 ft. in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.
Barley was sown at the rate of 50 lb. per acre.
Oats was sown at the rate of 40 lb. per acre.
Rye was sown at the rate of 60 lb. per acre.
Field peas was sown at the rate of 30 lb. per acre.
Vetches was sown at the rate of 20 lb. per acre.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindooimbah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13 (two cuttings)	10	0	10
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

RUSSELL RIVER GRASS.

C.W.L.B. (Atherton) writes:—

"*Re* an article in December issue on Russell River Grass. When I was on a farm up here (Atherton) I had a lot of it on my place, and used to curse it pretty heartily on account of the speed with which it covered the ground. It is a fairly useful feed, especially as a change of diet, just after a grass fire while it is young and sweet, but it soon becomes frightfully coarse, almost like a sort of cane (on a very small scale, that is), and stock will not look at it. I think, however, that it will repay careful examination, for this reason:—I had a mob of poor horses in a paddock of it, and the beggars never seemed to be feeding, yet they were putting on condition. So I put in a Sunday watching them. They did not touch the "flag" at all, but put in the whole time painfully nipping off the full-grown seed-heads. As they soon got rolling fat, I judge that these seeds, which are small and round, something like rape, should contain some oil of a high food value. As the grass is a very prolific seed bearer, something might be done in the way of preserving the seed and feeding it in a balanced ration. One never knows. Another thing: the grass will never become a permanent pest in ploughable land, as one turning over settles it."

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

POINCIANA REGIA.

NATURAL ORDER LEGUMINOSÆ (Pulse or Pea family).

By E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(B.M.T. 2884, 1841) *Poinciana* (in honour of H. de Poinci, Governor of the Antilles in the middle of the seventeenth century, and a patron of Botany); *regia*, royal, Royal Peacock Flower. This magnificent tree was discovered near Foule Point, Madagascar, by M. Bojer, Professor of Botany at the Royal College of St. Louis, Mauritius, who in the course of a visit to Madagascar discovered and named both *Poinciana regia* and *Colvillea racemosa*.

Description.—A beautiful tree from 30 to 40 ft. high, having an erect trunk covered with a grey, smooth bark; branches spreading, somewhat pendulous at ends, particularly with new growth (this latter including stems); are bright green, the whole forming a beautiful symmetrical head.

Leaves.—Broadly ovate in contour, up to 2 ft. long, abruptly bipinnate, with from 11 to 24 pairs of pinnæ, that are from 2 to 5 in. long; leaflets oblong, blunt at each extremity, upon very short petioles, paler beneath, and one-nerved, in from 16 to 30 pairs about ¼ in. long. Common petiole (stem) grooved above, inserted upon a remarkably swollen fleshy base. The new leaves are of a very delicate bright green, darkening with age to a deeper tint. Stipules abruptly bipinnated, erect, not unlike small false leaves; they are deciduous, and only appear on the new growth.

Flowers.—Bright scarlet, in loose racemes, terminal, and from the axils of the upper leaves; petals five, almost orbicular, spreading, reflexed, tapering into long claws, veined on the upper side, and dashed with faint yellow lines above the base; upper petal more cuneate, crinkled at edge, variegated, and striated with red and yellow. Stamens ten, shorter than the petals, filaments red, anthers oblong, two-celled, style terminated by an obtuse stigma, green at base, about the same length as stamens, the complete flower when fully opened being about 5 in. across.

Pod.—Two-valved, of a rather woody texture, from 10 to 24 in. in length, 2 to 2½ in. broad, terminated by the persistent style. Seeds about ¾ in. in length, compressed, ash coloured, streaked with brown, and a very hard outer skin.

Propagation.—From seed. When sown fresh they germinate freely, notwithstanding the hard outer covering. It is a good plan to sow in well-drained boxes, covering the seeds with about an inch of sand; keep well watered and out in the full sunshine. The heat helps to germinate the seed quickly. It does not thrive really well in pots after the first season. The young plants are apt to become stunted, but if grown in the open ground a rapid growth can be looked for; being deciduous, they transplant well at end of winter. Old trees flower very well; it usually takes about ten years in the Brisbane district before they commence to produce flowers. Trees that flower well and produce a large crop of seed pods do not, as a rule, flower well the following season, but those that flower and do not seed bear a profusion of flowers each season.

This magnificent tree is widely cultivated throughout the tropical world, its gorgeous flowers making it a universal favourite. In India it is known as the "Flame of the Woods." In the Hawaiian Islands, where it has been largely planted, J. F. Rock, in his "Leguminous Plants of Hawaii," alludes to its strong root system, saying "not even the severest storms these islands experienced in December, 1918, uprooted a single tree of this species." In many places it is known as the "Flamboyan."

In Brisbane the *Poinciana regia* flowers in December and January. There are four fine specimens, and a number of newly planted ones, in the Botanic Gardens. A particularly fine tree that always flowers profusely is growing at Bowen Park, a smaller but a very fine specimen in the Museum Gardens, and numerous others in many private gardens, but room should be found for many more of this, probably the best of all flowering trees.

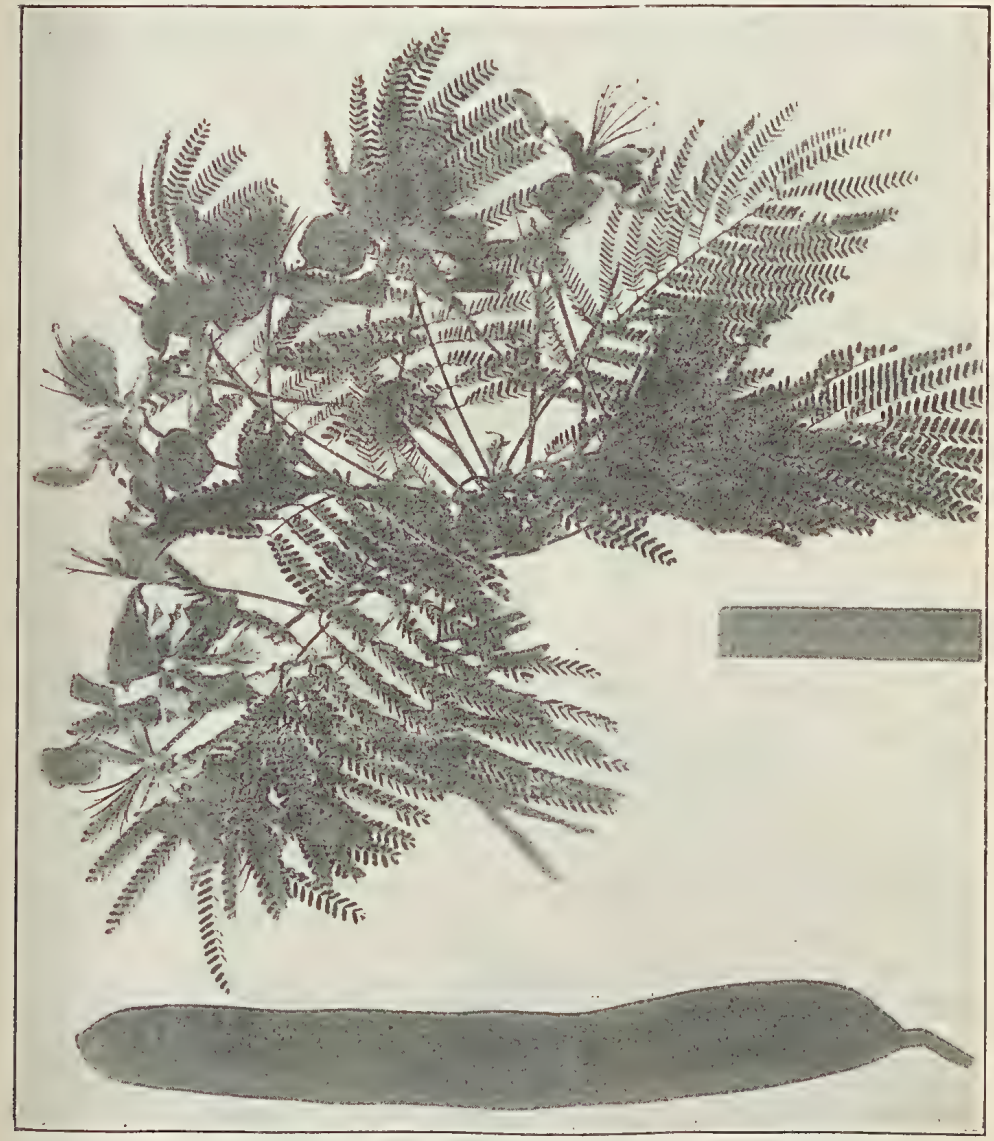


Plate 24.—Poinciana Regia.

A.—Seed pod. B.—Flower stem.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

No. 26.

WILD SALVIA (*Salvia coccinea*).

Description.—A strong-smelling undershrub of 2 to 3 ft. Stems quadrangular, downy, often with a purplish tinge. Leaves ovate or triangular ovate, 1 to 2 in. long, on a petiole (leaf-stalk) of 1 to 1½ in.; under-surface slightly wrinkled and clothed with white hairs; the edges toothed with rounded teeth. Flowers scarlet (rarely pink or pure white), borne in whorls along a slender spike, each whorl of flowers subtended by two green bracts; each individual flower is on a pedicel (stalklet) of about ¼ in. Calyx dark-green or tinged with purple, prominently ribbed, about 5 lines long. Nutlets ("seeds") light brown, ellipsoid, about 1 line long, situated at the bottom of the calyx tube.

Distribution.—A native of the warmer parts of North and South America; naturalised in most of the subtropical or warmer parts of the globe.

Botanical Name.—*Salvia*, from Latin *salvo*, I save, on account of the use of several species of the genus as healing and curative herbs; *coccinea*, Latin, of a scarlet colour.

Common Name.—Commonly known as "Wild Salvia" on account of its similarity on a small scale to the common garden plant *Salvia splendens*.

Properties.—This plant has been introduced into most warm countries as a garden plant. So far as I know, it does not possess any economic value.

Some years ago it was reported from the Beenleigh district, south-eastern Queensland, as a weed believed to be causing abortion in cows. I had not further heard of the matter until Mr. W. Greenwood, of Lautoka, Fiji, supplied me with the following note:—"In the Proceedings of the Hawaiian Entomological Society, in Vol. I., page 1179, the following account of the plant occurs under a description of a trip to one of the smaller Hawaiian Islands: 'At about 1,500 ft. elevation the introduced red-flowered salvia (*S. coccinea*) was growing wild; this was probably an escape from gardens, and which, if not eradicated, will become a pest (if it is not one already), as it is known to produce abortion in cattle.'" Mr. Greenwood goes on to say that the plant is a common weed in parts of Fiji, but he has heard of no harmful properties being attributed to it by cattlemen there.

The reports, however, of the plants causing abortion in cattle from two widely separated sources is remarkable. An allied plant *Mentha satureoides* (the "native pennyroyal"), a common weed in Queensland, was recently brought to me as being illegally used as an abortifacient, and the use of the common pennyroyal (*Mentha pulegium*) in this capacity is well known.

Eradication.—So far as observed in Queensland, the "wild salvia" is not a particularly aggresive weed, and calls for no special method of eradication.

Botanical reference.—*Salvia coccinea* Juss. ex. Murr. in Comm. Gotting. I. (1778), 86, tab. I.

THE DAIRY PRODUCE ACT.

Vendors of butter, cheese, and condensed milk are now directed to register under "*The Dairy Produce Act of* 1920." Forms of application may be obtained from the local dairy inspector or the nearest clerk of petty sessions, and the application for registration, together with the prescribed fee of 2s. 6d., should be posted direct to the Department of Agriculture and Stock, Brisbane. Owners of cream depôts, butter, cheese, and condensed milk factories, butter and milk carts, farm produce agents, and vendors of fertilizers and margarine are reminded that they must immediately register licenses for the year 1922 with the Department of Agriculture and Stock.

Plate 25.—Wild Salvia (*Salvia coccinea*).

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 8.

OPOSSUM WOOD (*Quintinia Sieberi*).

Common Name.—Opossum Wood (may originate from the peculiar wrinkles of the bark, which might have been attributed by bushmen to the scars left by the claws of opossums; the peculiar markings of the bark, which are a natural feature of it, resemble the scars left by opossums' claws).

Derivation.—*Quintinia,* in memory of La Quintinie, a French botanist; *Sieberi,* after F. W. Sieber, a botanical collector, of Prague, Bohemia, who spent seven months in collecting plants in New South Wales in 1823 (J. H. Maiden).

Description.—A tree attaining a height of 70 ft. and a barrel diameter of 2 ft. Barrel not prominently flanged at base. Bark dark brown, sometimes almost black, often wrinkled and with a row of scales on each side of the wrinkles; when cut, light brown, white near sapwood; measurement of bark, $\frac{3}{8}$ in. thick on a tree with a barrel diameter of 1 ft. 9 in. Sapwood white. Branchlets, leaves, and inflorescence hairless. Leaf stalks, $\frac{3}{8}$ to $\frac{1}{4}$ in. long. Leaves alternate, egg-shaped or elliptical in outline, mostly protracted into a short blunt point at the apex, lateral nerves and net veins visible on both surfaces; measurement of leaf blade 3 to 4 in. long, two to three times as long as broad. Flowers in bunches (panicles consisting of racemes) at the ends of branchlets; the bunches, which are about as long as they are broad, are often about as long as the leaves. Stalklets of flowers about 1/16 in. long. Flowers about $\frac{1}{8}$ in. diameter when expanded; the lowermost part, the calyx, funnel-shaped, about $\frac{1}{8}$ in. diameter, with five minute triangular lobes at the rim. Above the calyx are the five petals, each over $\frac{1}{8}$ in. long. Alternating with the petals and shorter than them are five stamens. The ovary, in centre of flower, is surmounted by a finely three to five furrowed style nearly $\frac{1}{8}$ in. long. Fruiting capsule nearly $\frac{1}{8}$ in. diameter, three to five celled, with several seeds in each cell, the five persistent calyx teeth forming a rim near the top, and the five styles separating from the base to near the summit and persistent on the capsule at its top. Seeds brown, less than 1/16 in. long.

Flowering period.—October and November; in fruit in December and January.

Distribution.—Confined to Australia. Common in the scrubs of the higher altitudes of Macpherson Range, National Park, ranges near Killarney, and Mistake Mountains. New South Wales, from near the Victorian border on the south to the Tweed River on the north; common in the scrub of the gorges of the Blue Mountains.

Uses.—Very little appears to be known about the commercial value of the timber.

Remarks.—It is a remarkable fact that this tree generally begins life on the trunks of tree ferns, where the seed germinates and the young trees develop.

References.—*Quintinia Sieberi,* A. de Candolle: Monog. Camp. 90; Bentham: "Flora Australiensis," vol. II., p. 438; F. M. Bailey: "Queensland Flora," Part II., p. 531; J. H. Maiden: "Forest Flora of N.S.W." vol. VI., p. 28, with figure.

LONG-LIVED BRITISH ENGINES.

Many examples have come to light of British engines which have been at work from the very earliest days of steam engineering. The Science Museum in London has recently placed among its exhibits a pumping engine made in the year 1791, by Newcomon. This engine was at work until the year 1915 at a colliery near Derby. Another engine, which was made in the early part of the nineteenth century, has also been presented to the Museum. Both engines are still capable of doing useful work, although they represent pioneer types very different from the British steam engines of to-day.

Photo by the Authors.]

PLATE 26.—OPOSSUM WOOD (*Quininia Sieberi*), Ranges eastward of Emu Vale, Killarney District.

PLATE 27.—OPOSSUM WOOD (*Quintinia Sieberi*).

A.—Flowering branchlet. B.—Fruiting branchlet. C.—Leaf, showing underside.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1921.

The weather for the month was very unfavourable for egg-production. The first three weeks were intensely hot, and during the last week 7 in. of rain fell. The outstanding feature of the month's laying was the splendid score of 170 eggs by T. Fanning's pen of White Leghorns. Broodiness has again been troublesome, but not the same extent as in November. There are odd cases of moulting, most of which are birds which have just left the broody coop. The health of the birds has been excellent. Green feed during the early part of the month was very scarce, but the excellent rains should account for a plentiful supply for the rest of the test. The following are the individual scores:—

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	141	1,195
*W. and G. W. Hindes	Do.	141	1,185
*Mrs. R. Hodges	Do.	145	1,149
R. Gill	Do.	114	1,142
*T. Fanning	Do.	170	1,131
*H. Fraser	Do.	139	1,115
*Geo. Trapp	Do.	108	1,090
F. Birchall	Do.	113	1,068
*C. M. Pickering	Do.	127	1,074
Oakleigh Poultry Farm	Do.	119	1,054
H. C. Thomas	Do.	95	1,043
*H. C. Towers	Do.	84	1,034
*W. Becker	Do.	123	1,032
R. C. Cole	Do.	117	1,022
*Thos. Eyre	Do.	136	1,017
*R. C. J. Turner	Do.	137	1,016
W. A. Wilson	Do.	110	1,010
*J. W. Newton	Do.	126	1,010
*Thos. Taylor	Do.	136	1,001
*C. Goos	Do.	93	987
Mrs. E. White	Do.	103	979
*E. Chester	Do.	129	976
*S. L. Grenier	Do.	107	975
M. F. Newberry	Do.	107	970
*E. A. Smith	Do.	117	968
Bathurst Poultry Farm	Do.	102	964
*G. W. Williams	Do.	117	959
*Mrs. L. F. Anderson	Do.	117	956
*B. Chester	Do.	117	955
*J. W. Short	Do.	118	954
W. Barron	Do.	98	951
H. Stacey	Do.	93	939
*Haden Poultry Farm	Do.	117	921
C. A. Goos	Do.	110	916
*H. P. Clark	Do.	125	908
Mrs. E. Z. Cutcliffe	Do.	92	888
E. Stephenson	Do.	97	870
*W. and G. W. Hindes	Brown Leghorns	74	841
Linquenda Poultry Farm	White Leghorns	106	854
W. M. Glover	Do.	96	829
Brampton Poultry Farm	Do.	105	822

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	110	1,190
*R. Burns	Do.	138	1,156
*A. E. Walters	Do.	120	1,118
*T. Hindley	Do.	127	1,118
W. Becker	Langshans	127	1,115
*Parisian Poultry Farm	Black Orpingtons ...	130	1,086
*Jas. Ferguson	Chinese Langshans ...	110	1,083
*C. C. Dennis	Black Orpingtons ...	124	1,067
Rev. A. McAllister	Do.	77	1,052
Jas. Ryan	Rhode Island Reds ...	108	1,044
Geo. Muir	Black Orpingtons ...	106	1,039
*E. Morris	Do.	121	1,036
*E. F. Dennis	Do.	119	1,013
Jas. Potter	Do.	86	998
Jas. Every	Langshans	84	990
*J. Cornwell	Black Orpingtons ...	108	987
*N. A. Singer	Do.	128	976
*R. Holmes	Do.	98	920
*J. E. Smith	Do.	112	916
*A. Shanks	Do.	109	910
*E. Stephenson	Do.	85	907
*H. C. Chaille	Do.	121	900
G. Cummings	Do.	87	897
*Mrs. G. Kettle	Do.	101	885
*E. Oakes	Do.	132	882
J. W. Newton	Do.	92	864
F. Harrington	Rhode Island Reds ...	110	816
F. C. Hart	Black Orpingtons ...	106	756
Total	... ...	7,800	68,491

* Indicates that the pen is being single tested.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	188	202	220	190	224	171	1,195
W. and G. W. Hindes (W.L.) ..	209	183	193	213	207	180	1,185
Mrs. R. Hodge	190	194	211	197	202	155	1,149
T. Fanning	205	182	203	176	179	186	1,131
H. Fraser	217	160	195	189	188	166	1 115
Geo. Trapp	195	166	187	175	196	171	1,090
C. M. Pickering	198	181	180	162	195	158	1,074
H. C. Towers	184	160	174	144	168	204	1,034
W. Becker	190	194	162	161	191	134	1,032
Thos. Eyre	179	167	134	181	185	171	1,017
R. C. J. Turner	174	161	166	158	175	182	1,016
J. W. Newton	170	189	195	174	121	161	1,010
Thos. Taylor	167	171	163	142	156	202	1,001
Chris. Goos	175	180	142	124	149	217	987
E. Chester	183	162	152	160	156	163	976
S. L. Grenier	159	189	136	168	165	158	975
E. A. Smith	197	157	175	162	156	121	968
G. Williams	217	174	133	137	154	144	959
Mrs. L. Anderson	167	171	155	152	167	144	956
B. Chester	135	163	186	157	168	146	955
Haden Poultry Farm	106	152	168	169	158	168	921
H. P. Clarke	198	123	158	125	164	140	908
W. and G. W. Hindes (B.L.) ..	120	145	122	116	138	200	841

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	141	177	234	179	200	225	1,156
A. E. Walters	211	197	177	184	169	180	1,118
T. Hindley	197	196	200	153	178	194	1,118
Parisian Poultry Farm	193	179	176	234	127	177	1,086
J. Ferguson	175	167	167	208	179	187	1,083
C. C. Dennis	179	163	164	197	185	179	1,067
E. Morris	195	179	127	193	171	171	1,036
E. F. Dennis	159	185	165	159	165	180	1,013
J. Cornwell	157	161	164	181	148	176	987
N. A. Singer	171	149	160	163	144	189	976
E. Stephenson	181	147	156	161	112	150	907
R. Holmes	129	162	161	164	178	126	920
J. E. Smith	197	212	142	114	129	122	916
A. Shanks	124	150	155	162	149	170	910
H. C. Chaille	110	165	157	185	155	128	900
Mrs. G. Kettle	144	174	192	95	132	148	885
E. Oakes	135	153	154	174	131	135	882

CUTHBERT POTTS,
Principal.

CHICKEN POX.

By J. BEARD, Poultry Instructor.

Chicken-pox is due to an ultra-microscopic germ, the nature of which is not known. This disease affects chickens, pigeons, canaries, and turkeys. Geese, ducks, and guinea fowls are immune. Turkeys are very liable to contract it; as for fowls, their resistance generally varies inversely with the age of the bird.

The death rate from the disease among chickens from two to three weeks old is very often 100 per cent., whilst with chickens two to four months old it is sometimes nil. Birds of pure breed are less resistant than their crosses. Minoreas and leghorns are the most susceptible.

The infection can either be mild or severe, depending on the number, size, and seat of the nodules. At times the nodules are not any larger than a sorghum seed, and fall off without any treatment, the infection disappearing in about six weeks without affecting the general health of the birds. In severe cases the nodules are very large in size, inflammation sets in through scratching, and the nodules become tumour-like in appearance. When the eyelids and angle of the mandibles are affected, the beak remains open, the bird being unable to close it. The inflammation soon reaches the mouth, which is covered by a thick false membrane. The birds, being thus blind and unable to pick their food, soon become anaemic and emaciated, and die of starvation or are poisoned by other germs which infect the nodules and the mucus lining of the mouth. This disease prevails all the year round, but is more intense at the beginning of the summer, the death-rate being heavy from November to February.

It is said that chicken-pox is highly contagious, though the causes of infection have never been clearly defined. It is noticed that the disease prevails in an epizootic state during the dry season, *i.e.*, from November to February, and is more or less sporadic during the other months of the year. It has been said that dust is the medium of infection and that the disease is transmitted from bird to bird. This theory does not hold good, however, when one considers that the disease prevails all the year round, and that it may appear suddenly in localities where it was unknown before. It is evident, therefore, that the infection is carried through some other channel.

From observations made, I am of opinion that the infection is transmitted directly from one bird to another in exceptional cases only, but is more usually conveyed by a vector, which may be the mosquito or any night-biting insects, such as bugs, or sand-flies. To prevent the disease from spreading, the affected birds should be segregated.

Treatment.—Apart from the serum, which has not yet proved of much value, there is no specific remedy known against chicken-pox. The best-known remedies have never given any good results, except in mild cases, which, no doubt, have recovered more quickly without treatment. Cauterisation by means of metallic salts generally increases the inflammation, and should only be used in special cases—for example, when mouth and eyes are to be dressed. My experience has shown that the less one interferes with the sickness the quicker is the recovery. The removal of the crust or scab with a view of obtaining a rapid cure complicates matters, since the sores which are protected by their crust are thus exposed to further infection. It may, however, be necessary at times to apply treatment in order to avoid ophthalmia or to prevent the false membranes from invading the mouth.

The false membranes arise from the nodules existing on the margin of the beak and at the junction of the mandibles. In such cases the crust, which must be previously softened with a lukewarm solution of boric acid, is removed and the sore painted with iodine. The false membrane of the mouth can be detached by means of a swab and the front painted with iodine and glycerine or with some specific containing tannic acid.

During the attack add magnesia to the drinking water, and supply twice a week epsom salts to the morning mash at the rate of one packet to twelve adult fowls. Avoid feeding meat, maize, or any other starch-containing foods in any form.

SUGAR: FIELD REPORTS.

Mr. J. C. Murray, Southern Field Assistant, reports under date 6th January, 1922, as follows:—

In the course of the month of December the districts of Maryborough, Pialba, Yerra, Mount Bauple, and Childers were inspected.

Maryborough.—The crushing season just ended at Maryborough has been a satisfactory one. Good average tonnages were obtained, while, generally, the c.c.s. values were satisfactory. More cane has been planted than has been the case for some years, and the prospects of a good yield next year look bright. The young plant crop is very forward, while ratoons are stooling vigorously.

The farmers on Tinana Creek have considerably developed their holdings this year. Big timber and its clearing are the chief obstacles met with in the initial stages of preparation on Tinana Creek, but in the course of time the farmers hope to make their soil entirely fit for intensive cultivation. Farmers could profitably turn their attention more to adding texture to the soil by the use of vegetable manures, and endeavouring to ascertain, by local experiment, the value of concentrated fertilisers. In practically all cases, stable manures cannot be too highly recommended. Observation of different canes, with a view to obtaining a good early maturing variety, is recommended to growers, as this season many of the canes had to be cut while immature. In this respect H.Q. 285 is a cane which should give satisfactory results.

Pialba.—The growers have had good returns this year. Much of the land is still badly in need of added matter calculated to improve the texture and reduce soil acidity, but, nevertheless, farming is reaching a higher standard. The 1922 crop should be a good one. Plant cane is growing well, while most of the ratoons present a satisfactory appearance. In some places stools are diseased and have refused to ratoon, and it is recommended as a precautionary measure that stools be ploughed out next year and carted off the field. In cases like this there is the probable danger of a gradual infection of healthy cane; therefore it is well to act before this happens.

D. 1135, N.G. 16, M. 187, M. 1900 Seedling, Q. 813, and Rappoe are canes that are now making a good showing. The introduction of larger areas of 1900 Seedling and Queensland 813 would probably give the farmers more satisfactory tonnages than hitherto.

Yerra.—The farmers are still busy clearing new scrub land and farming their already-improved holdings. Their need for good roads is urgent. As the result of having to cut, in some cases, too early, there was considerable loss on some of the Yerra crops, particularly on the D. 1135 and 1900 Seedling. If possible, the latter variety at least should never be cut before the 20th September; otherwise there is a loss, both in c.c.s. and subsequent shy ratooning of the cane.

Among the varieties growing and making favourable progress are M. 16804, E.K. 1, H. 22, Q. 813, Shahjahanpur, H.Q. 77, E.K. 28, H.Q. 77, H. 146, J. 147, N.G. 81, Q. 970, E.K. 2, and H.Q. 285. Most of these have only been recently introduced, but are promising canes, particularly the Q. 813, which the farmers are highly recomemnded to plant.

Mount Bauple.—Canegrowing is being vigorously carried on. It is quite a fallacy to suppose that this district is unsuited for sugar production. On the contrary, given fair average weather conditions, the farmers here can rely upon getting as high c.c.s. values and tonnages as anywhere south of the tropics. A good deal of attention is being given by the growers to fertilisation. This is an important matter at Mount Bauple, and the growers are recommended to make full use of the facilities provided by the Bureau for obtaining information on this matter.

Good work is being done by Mr. Holloway, head teacher at the school, in connection with encouraging the children to take an interest in cane culture, and with this end in view he has a small plot established, and he hopes later to give some information as to results. Q. 813 is making remarkable growth, and the farmers in the course of time will probably be growing this cane as a staple variety.

Stools in places are affected, and the precautionary measure of ploughing out old stools would be a good one. Liming on old soils would also be very beneficial. Good results have been obtained by filterpress cake on some Bauple soils, but the use of green manures and lime would be cheaper and much more efficient.

Cane pests are, fortunately, not serious just now, and this is due in a measure, especially with regard to the borer, to care in planting and the destruction of cane that might have deteriorated into rubbish in the vicinity of healthy cane.

Childers.—Childers at present presents the appearance of a large and well-tended landscape garden. The farms are marvellously green, and much cultivation has been done by growers. The majority of the farmers are up to date in their equipment. Fertilising on a fairly large scale is now being undertaken. Farmers are strongly advised to be cautious before indiscriminately applying chemical fertiliser. Ample facilities are at hand whereby they can get soil and fertilisers tested, and so save, perhaps, time and money. Advice on all methods of manurial experiment can be obtained from the Bureau.

Regarding cane varieties, 1900 Seedling and D. 1135 appear to be, so far, the best of the staple varieties, although there are some very fine crops of Q. 813 growing. Regarding the two first-mentioned canes, there was considerable loss in c.c.s. value this year through cutting too early, and growers are recommended to plant these canes in conjunction with H.Q. 283, which is a good cropper and an early maturing variety. A small area of H.Q. 285 brought from the Maroochy River is already doing well as a young plant crop. Up the line, at Booyal, the farmers are once again taking up canegrowing seriously. There are some very fine areas showing at present, especially D. 113. As many as forty-eight sticks of plant cane of this variety were counted on one stool. Other canes doing well at Booyal are M. 1900, Striped Singapore, Rappoe, E.K. 28, E.K. 1, J. 247, and Shahjahanpur. The three lastnamed, recently distributed from Bundaberg Experiment Station, are looking very promising. About 2,000 tons of cane were sent from Booyal this season, and by appearances this tonnage should be increased 50 per cent. next season.

There is a great deal of fine sugar land still to be cleared on this Upper Burnett country; in fact, there is sufficient to support another sugar-mill.

Mr. E. H. Osborn, the Northern Field Assistant, reports under date 11th January, 1922, as follows:—

Gordonvale.—Early in the month of December a short visit was paid to this district. Conditions at the time were very dry. The mill was very busily crushing and preparing for extensive alterations and additions necessary to cope with the extra tonnage of cane entailed by the redistribution of areas in connection with next season's crop.

A flying visit was made to the Riverstone area. Mr. George Alley (of Blackwell and Alley) advised in connection with their harvesting that a 5-acre block of river flat Plant Badila had cut at the rate of 37 to 38 tons per acre. As this particular block is probably the oldest cane land in the Mulgrave area, having previously grown cane for the old Pyramid Mill some thirty-five years or so ago, and having been practically under cane ever since, its fertility is remarkable. Lately Mr. Alley has used about 4 cwt. of mixed fertiliser on plant cane, and about half of that quantity of sulphate of ammonia upon ratoons.

Further up the river several new farmers were noticed growing cane on portions of the old Pyramid plantation.

A very large number of greyback beetles was noticed in the weeping figs and other feeding trees in the area, some being even found in the mosquito curtains of the hotel. These were evidently attracted by the gaslight.

Babinda.—Dry weather prevailed in this region until the 11th, when some very welcome showers fell. Milling operations for 1921 had ceased, and the cane harvested amounted to 117,321 tons, equalling a return of 18.1 tons per acre. Of this tonnage, about 90 per cent. was Badila, the remainder being mainly D. 1135 and H.Q. 426. The acreage cut was 6,472, and a further 549 acres were allowed to stand over. Burnt cane, in the proportion of 45 per cent., was cut. Next season some 7,000 acres should be harvested.

During the crushing period no strikes or industrial troubles of any kind caused delay, and the early finishing up will give the growers a good chance to thoroughly work their farms. Early plant and also the earlier-cut ratoons have not made the growth expected in this area. The later-planted cane, and also the ratoons cut later on in the season, are, however, looking pretty well.

Some splendid plant and also ratoon Badila were seen upon Mr. P. Larsen's Bartle Frere holding. Both on his river flat and red soil very fine growth was noticed, and the cane looked remarkably green and healthy.

Around Mopo some very good crops of plant cane were seen. They were all very clean, good coloured, and strong in growth. Very few beetles have been seen so far this year in the Babinda area.

South Johnstone.—This district was revisited during the third week in December. Weather conditions were dry, no rain of any consequence having fallen for about a month. Later, however, after a couple of preliminary showers, heavy falls occurred, making the total for the month to date (28th December) of 18.71 in., 17.96 in. of which fell since the 19th. At time of writing the cane everywhere looks splendidly green and vigorous. After such heat, the growth is naturally forced, and the rich volcanic and alluvial soils respond very readily. On the red soil the cane looks extremely well. Many pony ploughs are being used among the stumps with very good results.

Around the Kalbo country the work of getting the cane from the low-lying alluvial flats up to the branch line leading to the main locomotive line at Kalbo Junction is distinctly arduous, comprising, as it does, the haulage of the cane up a very steep ridge, 12 chains in length, by means of a wire rope attached to a donkey engine supplied by the South Johnstone Central Mill.

CANE PESTS CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (13th January, 1922) from the Entomologist at Gordonvale, Mr. Edmund Jarvis:—

"During the past month the time has been very fully occupied in experimentation affecting the adult form of our 'grey-back' cane beetle. Unfortunately, this important phase of its life-cycle occupied only a couple of months—viz., during the flighting period—whereas the grub stage admits of investigation during about six months of the year.

"The wet season set in here on the evening of 19th December, and by midday on the 21st 7.18 in. of rain had fallen at Meringa, thus putting a stop, for the time being, to field experiments and fumigation of the soil with carbon bisulphide.

"*Experiments with Deterrents.*

"Our plots at Carrah were treated between 12th November and 8th December in order to allow for beetles emerging at the beginning of November, and for a second emergence on the 18th of that month. The various insecticidal substances used with a view to inducing beetles to avoid the treated areas were coal-tar, naphthalene, chloride of lime, tobacco dust, and carbolineum emulsion, each plot being one-eighth of an acre and separated by a control plot.

"To avoid labour involved in emulsifying and spraying the tar, it was prepared by mixing the quantity needed—viz., 2 gallons (= 16 gallons per acre)—with five kerosene tins full of sifted soil, so that it could be easily sprinkled, either by hand or machine, on each side of and between the stools of cane, in a strip about 3 ft. wide. When examined twelve days later (0.15 in. of rain having fallen during the interval) the tarry odour was quite pronounced, and even after twenty-six days it was still perceptible, although not sufficiently so to be repellent. The chloride of lime, which was also mixed with soil and applied at the rate of 160 lb. to the acre, maintained its odour for nearly a week, but lost it about nine days after. The naphthaline was administered at the rate of 120 lb. per acre, and retained its repellent properties longer than the lime; while the carbolineum emulsion did not keep its odour beyond a few days. Tobacco dust, applied at the rate of 96 lb., retained its odour for some days after application. It will be interesting to note later on whether any of these repellents have induced egg-laden female beetles to oviposit elsewhere.

"Poisoning the Adult Beetle.

"As mentioned last month, five sets of experiments have been conducted this season, comprising eighty-nine cages containing leaves sprayed with various arsenical solutions.

"The results obtained, although not altogether conclusive, were sufficiently encouraging to warrant further experimentation along similar lines next year. One point of importance observed was the fact that beetles to be experimented with should be captured directly they emerge, and before they start feeding.

"After being four or five days on the trees, they cease feeding and practically eat little or nothing during the remainder of their aerial existence. For instance, out of fifteen beetles collected on 2nd December (nine days after emergence) about 50 per cent. did not live more than a week; and during the course of this experiment only one beetle out of this number touched the fresh figleaves placed in its cage.

"Those used for the first experiment were captured on 5th November, about four days after emerging from the soil, but even then the majority had ceased feeding, as only eight out of the thirty touched the leaves placed in the cages. The first beetles to die were those that had eaten portions of the poisoned leaves.

"Paris green 1 lb., lime 1½ lb., in 8 gall of water, proved fatal from four to seven days after feeding; while arsenate of lead took nine days. About 50 per cent. of these beetles died just a fortnight after capture, the last succumbing after twenty-four days. The beetles that lived longest (from sixteen to twenty-four days) were those that took no food whatever. The specimens that fed were four control beetles, and a similar number from treated cages.

"In an experiment conducted on 22nd November, it was found that confined specimens of albohirtum would feed indifferently either on Moreton Bay Ash (*Eucalyptus tessalaris*) or the 'tar' tree (*Semecarpus australiensis*) when leaves of both species were placed together in the cages. I have previously mentioned that this cane-beetle does not, like some insects, exhibit a keen sense of discrimination in the choice of food, but, on the contrary, appears indifferent as to its flavour, being as ready to devour leaves sprayed with poisons as untreated foliage.

"Parasite of Moth-Borer.

"It will be of interest to mention that success has attended our efforts to breed and propagate the Braconid wasp, which, as mentioned in last month's report, is an insect enemy of the moth-borer of cane in New South Wales, where it is credited by Oliff with being a parasite of great economic importance.

"I am of opinion that the control of our large moth-borer (*Phragmatiphila truncata* Walk.) in the Cairns district is due mainly to the activities of this tiny wasp.

"The specimens bred by us this month from ratoons collected at Banna were confined in suitable cages with borer-caterpillars on 5th December, and having parasitised them, produced broods of wasps three weeks later (25th December). In view of the fact that each of these parasites is able to lay nearly a hundred eggs (our highest record here at present being 93), and, moreover, has a life-cycle of only three weeks, it is not surprising that moth-borer attack should be confined here to a few localities where it is seldom noticed except early in the season, and never assumes serious proportions. The parasite in question (*Apanteles nonagriæ* Oliff) is a minute black wasp, no bigger than a sandfly, and having threadlike antennæ, which in the male are much longer than the body, but a little shorter in the opposite sex. The female punctures the caterpillar by means of a special piercing instrument or ovipositor, and deposits eggs inside it, which in due course produce maggots that start at once to feed on the internal tissues. This larval stage occupies about fourteen days, after which the maggots leave the body of their host, and, remaining together, spin white, egg-like silken cocoons, which are usually concealed behind some dead leaf-sheath, but sometimes are located inside the tunnel of the bored ratoon.

"These cocoons, which occur side by side in a flattened mass, and are about three-sixteenths of an inch long, with rounded ends, finally develop a few days later into wasps.

"We hope to introduce this useful parasite as soon as possible into the Ayr district, where this year the moth-borer has occasioned serious losses in certain cane areas on Rita Island and elsewhere.

"Beetle Borer Parasite.

"Bred specimens of the tachinid fly-parasite of *Rhabdocnemis obscuris* Boisd., the well-known beetle-borer of cane, continue to emerge freely in our insectary from cane sticks artificially stocked with beetle grubs during November.

"Numbers of these parasites have been liberated this month (December) on plantations at Riverstone, and on land subject to borer on the banks of the Mulgrave River at Gordonvale. Several letters have been received from the Innisfail and Babinda districts, asking for tachinid flies, so, in order that all requests may be met, we intend to continue the breeding of this insect during January and February.

"Beetles as Food.

"A sample of beetle-meal prepared from our grey-back cockchafer has been submitted this month for analysis, and may prove to be a valuable food for poultry. The Curator of the Zoological Gardens in Sydney has tried for some years past to obtain meal of this nature for feeding insectivorous birds, and is prepared to offer a good price if the analysis should prove favourable. In the present instance the beetles collected were killed with hot water and dried at once in a simple home-made oven of galvanized iron. The bodies were then reduced to meal by being passed through an ordinary corn-crusher.

"It might be of interest to mention that a manure is prepared from bodies of the European cockchafer. Guenaux states that this 'is equal to that of the best manure as regards phosphoric acid and potash, and is eight times richer in nitrogen. One hundred pounds of beetles are, therefore,' he remarks, 'equal to 800 lb. of manure.' In view of this statement it seems probable that the 22 tons of beetles collected one year in the Cairns district might have been turned to very profitable account. In the event of collecting being again taken up here, it would be advisable to look into this matter of the manurial value of our cane-beetle, and, if possible, defray in this way part of the expense of collecting."

FOREIGN INGREDIENTS IN AGRICULTURAL SEEDS.

By F. F. COLEMAN, Expert under the Pure Seeds Acts.

Every purchaser should know the purity and germination of the seed that he intends to sow; also its freedom from diseased or insect-infested seeds. These matters can only be decided by a thorough examination of a large and truly representative sample. Seeds constitute the most variable material that the farmer or merchant purchases, and the success or failure of a crop, or even succeeding crops, may be wholly determined by the kind or condition of the seed sown. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the *purity* and *germination* of all seeds purchased, before sowing or offering them for re-sale.

Analysis and Method of Sampling.

Samples of any seeds purchased or offered for sale as seed for sowing, may be sent to the Department of Agriculture for analysis. All samples must be drawn from the actual bulk in the sender's possession, and care should be taken to obtain a small quantity from each bag, carefully mixing the portions so obtained, in order to make the sample truly representative of the bulk.

Marking of Samples.

All samples sent for analysis must have the following particulars plainly written thereon:—

Name of seed;

Quantity the sample represents, and marks, if any;

Name and full address of sender.

Example:—

Seed for analysis, representing 30 bags Japanese millet,

Ex A. Smith, Farmer, Westgate.

From T. Brown, Produce Merchant, Exmouth.

Samples should be addressed as follows:—

Seed for Analysis,
The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

WEIGHT OF SAMPLES.

All samples of seed sent for analysis must not be less than the weights herein set out, and in the case of seeds containing a large amount of foreign ingredients *double* the weight mentioned should be sent.

Wheat, Oats, Barley, Maize, Rice, Rye, Cowpeas, Tares, Peas, Beans ..	8 oz.
Lucerne, Sweet Clover, Sorghum, *Sorghum sudanense* (Sudan grass), Panicum, Millet, Linseed, Canary, Prairie Grass, Buckwheat, Cotton	4 oz.
Rhodes grass, *Paspalum dilatatum*, Rye grass, Cocksfoot, Couch grass ..	2 oz.
All agricultural seeds other than those included above	2 oz.

FREE ANALYSIS FOR FARMERS.

No charge is made to farmers sending in samples of any seeds purchased by them for their own sowing, providing the following particulars are plainly written on each sample sent:—

Vendor's name and address.
Name of seed.
Quantity purchased.
Date of delivery.
Locality where seed is to be sown.
Name and address of purchaser.

VENDORS' FEE FOR ANALYSIS.

A fee of 2s. 6d. per sample will be charged for all samples sent by vendors for purposes of analysis. A vendor within the meaning of the Pure Seeds Acts is:—

> "Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds."

It will, therefore, be noted that the common acceptance of the Acts as referring only to seedsmen is erroneous. A Produce Merchant, Storekeeper, Auctioneer, Farmer, or grower of the seed are vendors under the Acts whenever they sell, offer, expose for sale, contract or agree to sell any seeds for sowing.

THE PURE SEEDS ACTS.

All vendors of seeds for sowing must comply with the Pure Seeds Acts and Regulations thereunder, copies of which may be obtained from the Government Printer, George street, Brisbane, for 1s. 7d. post free.

INVOICE MUST BE GIVEN BY VENDOR.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

FOREIGN INGREDIENTS.

Foreign ingredients include dead and non-germinable seeds, diseased or insect-infested seeds, weed seeds, or seeds of any cultivated plant other than that to which the sample purports to belong. Also inert matter, which includes chaff, dust, stones, or any material other than seeds, and broken seeds less in size than one-half of a complete seed.

The proportion or amount of foreign ingredients that may be contained in any seeds is prescribed by the Regulations.

"B" GRADE SEEDS.

Seeds in which the amount of foreign ingredients exceeds the proportion set forth in Schedule A of the Regulations, but does not exceed the proportion set forth in Schedule B, may be sold as seeds for sowing, providing they are contained in bags or packages to each of which is affixed a label, brand, or stamp, clearly and indelibly marked, specifying: The kind or kinds of such seeds; that the seeds are "B" grade, for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed; the name and address of vendor. All invoices relating to such seeds must be distinctly marked "B Grade Seeds."

QUALITY FIRST.

The best is the cheapest, whatever the price, and quality should be the one and only consideration that determines a purchase. An opinion as to the quality or condition of any agricultural seed is useless unless based on the actual facts revealed by an analysis conducted under uniform scientific methods. This work is undertaken by the seed laboratory of the Department of Agriculture. Before sending samples, care should be taken to see that they are not only drawn from, but truly representative of, the bulk, and are marked in accordance with the particulars beforementioned.

COVERING LETTER.

All samples with *covering letter*, should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

THE ALL-HARVESTER MACHINE.

At a recent agricultural exhibition in Great Britain there was exhibited an attachment to a harvester which forms the first step towards eliminating all hand-labour in the harvest field, apart from the mere driving of the machine. This attachment is intended for standing the sheaves up after the harvester has cut and bound them. The judges at the exhibition thought so well of it that they awarded the makers a silver medal.

Answers to Correspondents.

RHODES GRASS.

R. F. M. (Gayndah)—

Rhodes grass has proved to be among the best for your district, and, like other fodder grasses, it responds to fair treatment. Reported failures are often due to overstocking, particularly before the grass has re-seeded and so firmly established itself. An absolute heavy stock-carrying drought-resister is hard to get.

Give Rhodes another chance.

PREPARING SAGE FOR MARKET.

E. D. (Spring Creek, Stanthorpe)—

Cut sage with sickle and dry on hessian or calico sheets.

TOBACCO-GROWING.

H. F. H. (Apsley, Winton)—

The present unsatisfactory system of marketing reduces the chances of success in tobacco-growing.

BANANA SOIL AND POTASH.

T. G. (Mount Lawson)—

The Director of Fruit Culture advises the use of a complete fertiliser suitable for bananas, described in previous issues of the Journal, and obtainable from any dealer in manures.

TO DESTROY MEAT ANTS.

F. L. W. (Birkdale)—

Pour half a cup of carbon bisulphide (any chemist) over the ants' nest. Stand off a safe distance and throw a match on to the soaked surface. A slight explosion will follow. Immediately after, cover the ant bed with a bag well saturated with water. The greatest care should be exercised in handling, keeping clothes free of, and igniting the compound, as it is highly explosive.

HAY-STACK MEASUREMENTS.

M. T. MILLS, (Christmas Creek)—

To calculate the contents of an oblong stack, multiply the length by the breadth, and the product by the total average height, and divide by 350 for old hay and 400 for new hay. This will give a rough idea of the contents, in tons. To find the total average height, add the height from the ground to the eaves to half the height from the eaves to the ridge.

Example.—

D to E = 12 ft.; $\frac{1}{2}$ of E to F = 5 ft.; 12 + 5 = 17 = total average height.

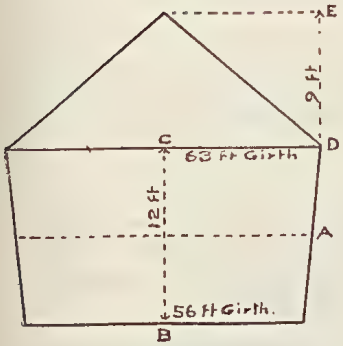
A to B = breadth=25 ft. B to C = length = 50 ft.

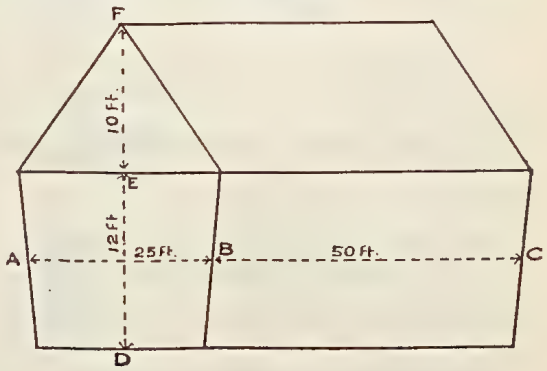
$50 \times 25 \times 17 = 21{,}250$ = total contents of stack in cubic feet.

$21250 \div 400 = 53\frac{1}{8}$ tons.

To calculate the contents of a round stack, take the girth at the bottom of the stack and add this to the girth at the eaves; half the sum is the mean girth. Square the mean girth, and multiply by 7/88, which will give the area of the base. Multiply this by the height, and this will give the contents, in cubic feet, of the bottom part of the stack.

To find the contents of the top portion of the stack, square the top girth and multiply by 7/88, by one-third of the height.





Example.—

Bottom Portion: Bottom girth, 56 ft. Top girth, 63 ft. 63 + 56 = 119 ÷ 2 = $59\frac{1}{2}$ ft.

A to A = $59\frac{1}{2}$ ft. = mean girth.

B to C = 12 ft. = height from ground to eaves.

$59\frac{1}{2} \times 59\frac{1}{2} \times \frac{7}{88} \times 12 = 3{,}379$ cub. ft. = contents of bottom portion of stack.

Top Portion: D to E = 9 ft. = height from eaves to top of roof. 9 ÷ 3 = 3.

$63 \times 63 \times \frac{7}{88} \times 3 = 935.7$ cub. ft. = contents of top portion of stack.

Total: 3,379 + 935.7 = 4,314.7 cub. ft. = total contents of stack.

4,314.7 ÷ 400 = 10.7 tons.

In the foregoing examples it is taken that the hay would go 400 cub. ft. to the ton. This is only approximate, as the weight per cubic foot varies considerably, according to the kind of hay, age, and other conditions. To ascertain the tonnage with any degree of certainty, it would be necessary to find the average weight of a cubic foot of the hay. This could be arrived at by cutting out cubes 1 ft. by 1 ft. by 1 ft. with a hay knife from different parts of the stack or hayshed, and weighing same.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that the young weeds will not make such vigorous growth during the next few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in all dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bag or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of sudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

Orchard Notes for March.

THE COAST DISTRICTS

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become overdeveloped before it is packed, otherwise it may arrive at its destination in an overripe and, consequently, unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality should be packed. Smaller or inferior fruit should never be packed with good large fruit, but should always be packed separately.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of, plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specky fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of the necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits, does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which again proved its superiority in the recent shipment of oranges from South Australia to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. No matter which case is used, the fruit must be sweated for seven days before it is sent to the southern markets, in order to determine what fruit has been attacked by fruit-fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit-fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach-moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moths will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been given in the Granite Belt area in the course of the present season by Mr. Rowlands, the Tasmanian Fruit Packing Expert, whose services the Queensland Government have been fortunate in securing, and whose practical advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the

soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening state, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1921.	Dec., 1920.		Dec.	No. of Years' Records.	Dec., 1921.	Dec., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	7·40	20	6·42	8·71					
Cairns	9·14	39	10·26	8·37	Nambour	6·00	25	13·76	3·67
Cardwell	8·34	49	13·63	4·23	Nanango	3·47	39	13·11	1·28
Cooktown	7·07	45	7·97	6·89	Rockhampton ...	4·19	34	19·42	0·98
Herberton	5·61	34	7·27	7·85	Woodford	5·19	34	12·73	2·08
Ingham	7·13	29	9·55	6·26					
Innisfail	12·10	40	17·72	5·31					
Mossman	12·34	13	24·28	9·51	*Darling Downs.*				
Townsville	5·53	50	5·55	1·21					
					Dalby	3·12	51	9·10	2·61
					Emu Vale	3·46	25	6·52	3·01
Central Coast.					Jimbour	3·02	33	7·68	0·88
					Miles	2·43	36	6·02	2·84
Ayr	3·70	34	9·09	2·78	Stanthorpe ...	3·42	48	6·61	2·84
Bowen	4·32	50	9·70	2·19	Toowoomba ...	4·11	49	8·07	4·10
Charters Towers ...	3·51	39	3·50	3·67	Warwick	3·41	34	9·27	2·40
Mackay	6·76	50	13·38	2 37					
Proserpine	8·28	18	19 66	2·10					
St. Lawrence ...	4·22	50	18·01	0·92	*Maranoa.*				
					Roma	2·29	47	4·89	2·50
South Coast.									
Biggenden	4·11	22	12·50	3·55					
Bundaberg	4·43	38	15·89	10·59	*State Farms, &c.*				
Brisbane	4·97	70	11·33	2·57					
Childers	4·91	26	15·45	7·90	Bungeworgorai ...	2·26	7	3·81	1·63
Crohamhurst ...	Nil	Nil	Nil	3·09	Gatton College ...	3·26	22	Nil	2·14
Esk	4·13	34	11·85	1·66	Gindie	2·63	22	2·16	1·49
Gayndah	3·78	50	11·11	6·98	Hermitage ...	2·73	15	7·47	2·31
Gympie	5·62	51	11·14	3·07	Kairi	7·66	7	5·78	6·09
Glasshouse M'tains	6·34	13	11·67	2·77	Sugar Experiment Station, Mackay	7·99	24	14·50	2·04
Kilkivan	4·08	42	12·33	3·17	Warren	2·88	7	10·05	1·40
Maryborough ...	4·51	50	11·23	10·08					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·0	6·51	5·24	6·46	5·45	6·25
2	5·1	6·51	5·25	6·46	5·45	6·24
3	5·1	6·51	5·26	6·45	5·46	6·23
4	5·2	6·51	5·27	6·45	5·46	6·22
5	5·3	6·52	5·28	6·44	5·47	6·20
6	5·4	6·52	5·28	6·43	5·48	6·19
7	5·4	6·52	5·29	6·42	5·49	6·18
8	5·5	6·52	5·30	6·42	5·50	6·17
9	5·6	6·52	5·31	6·41	5·50	6·16
10	5·6	6·52	5·31	6·41	5·51	6·15
11	5·7	6·52	5·32	6·40	5·51	6·14
12	5·8	6·52	5·33	6·39	5·52	6·13
13	5·9	6·52	5·34	6·38	5·52	6·12
14	5·9	6·52	5·35	6·38	5·53	6·11
15	5·10	6·52	5·35	6·37	5·53	6·9
16	5·11	6·52	5·36	6·36	5·54	6·8
17	5·12	6·52	5·37	6·35	5·54	6·7
18	5·12	6·52	5·38	6·34	5·55	6·6
19	5·13	6·52	5·38	6·34	5·55	6·5
20	5·14	6·52	5·39	6·33	5·56	6·4
21	5·15	6·51	5·39	6·32	5·56	6·3
22	5·16	6·51	5·40	6·31	5·57	6·2
23	5·17	6·51	5·40	6·31	5·57	6·1
24	5·18	6·50	5·41	6·30	5·58	5·59
25	5·19	6·50	5·41	6·29	5·58	5·58
26	5·19	6·50	5·42	6·28	5·59	5·57
27	5·20	6·49	5·43	6·27	6·0	5·56
28	5·21	6·49	5·44	6·26	6·0	5·55
29	5·22	6·48	...	...	6·1	5·54
30	5·23	6·48	...	...	6·1	5·53
31	5·23	6·47	...	...	6·2	5·52

PHASES OF THE MOON, ECLIPSES, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when summer time is not in force.

		H. M.
6 January	☾ First Quarter	8 24 p.m.
14 „	○ Full Moon	12 37 a.m.
20 „	☽ Last Quarter	4 0 p.m.
28 „	● New Moon	9 48 a.m.

Apogee on 3rd at 8·54 a.m.
„ on 30th at 10·24 p.m.
Perigee on 15th at 9·48 a.m.

5 February	☾ First Quarter	2 52 p.m.
12 „	○ Full Moon	11 18 a.m.
19 „	☽ Last Quarter	4 18 a.m.
27 „	● New Moon	4 48 a.m.

Perigee on 12th at 9·0 p.m.
Apogee on 27th at 12·48 a.m.

7 March	☾ First Quarter	5 22 a.m.
13 „	○ Full Moon	9 14 p.m.
20 „	☽ Last Quarter	6 43 p.m.
28 „	● New Moon	11 3 p.m.

Perigee on 13th at 9·30 a.m.
Apogee on 26th at 5·36 a.m.

The splendid phenomenon of an annular or ring-shaped eclipse of the sun will be seen, if clouds do not intervene, in North Africa (including part of the Suez Canal) and in South America on 27th and 28th March.

The only other eclipse of the year will be the Great Australian Total Eclipse of the Sun on 21st September, of which special particulars will be given.

The apparent proximity of the moon and Delta Tauri early in the evening of 9th January will be of interest to those who possess telescopes or binoculars, also the occultation of Omicron Leonis on the 16th, about 1 o'clock in the morning. On 7th February Delta Tauri will be occulted by the moon about 4 o'clock in the morning, also another small star in the same constellation half an hour later, followed by another within three quarters of an hour after that.

The occultation of Jupiter by the moon on 16th February will unfortunately occur about sunrise at Brisbane, but may be observable at Oontoo, Birdsville, and other places in the far south-west.

The planet Jupiter will be coming into view before midnight in February and March; Venus will pass from west to east of the sun on 9th February; and Mercury from east to west on the 14th. Before the end of March Jupiter and Saturn will be prominent evening stars.

On 21st March the sun will rise almost exactly due east, and set due west, passing from south to north of the equator.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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STANDARDS OF PURITY AND GERMINATION PRESCRIBED FOR SEED OATS, BARLEY, RYE, AND WHEAT.

BY F. F. COLEMAN, Expert under the Pure Seeds Acts.

"Many of our farmers have only a limited knowledge of weeds, and in many cases do not recognise those that are dangerous on their first appearance. Hence we have 'One year's seeding, seven years' weeding.' There are some weeds so noxious that if farmers knew their real character, and recognised the plants on their first appearance, they would postpone all other business until they were destroyed."—H. Mackellar.

Although buyers and sellers of wheat, barley, oats, and rye are able to form a good idea as to their market value, experience shows that they are frequently misled as regards purity and germination. It is in fact impossible to determine with any accuracy the purity or germination by a casual inspection of the sample; all opinions as to the amount of weed seeds, non-germinable seeds, or other foreign ingredients should be based on actual facts revealed by the analysis and germination-test of a large sample drawn from the actual bulk.

The following table gives information as to the purity and germination of samples examined at the Departmental seed laboratory in the course of 1921:—

Kind of Seed.	Percentage of Samples Germinating, Between—				Percentage of Samples up to the Standard of Purity and Germination prescribed for—		Percentage of Samples which did not comply with the prescribed Standards on account of—	
	100-90	89-80	79-70	69-0	A Grade.	B Grade.	Impurities.	Germination.
	%	%	%	%	%	%	%	%
Barley, Cape	82·9	14·3	..	2·8	77·2	17·1	2·9	2·8
Barley, skinless	76·2	23·8	..	..	76·2	23·8	..	..
Barley, malting	84·6	15·4	..	..	77·0	15·3	7·7	..
Oats	72·5	13·7	9·8	4·0	68·6	19·6	7·8	4·0
Rye	80·0	20·0	..	..	80·0	20·0	..	..
Wheat	82·6	13·1	4·3	..	82·6	17·4	..	..

The attention of both buyers and sellers in directed to the Regulations under the Pure Seeds Acts, which prescribe the proportion or amount of foreign ingredients allowed in barley, oats, rye, and wheat. Every farmer should be interested in the subject, which closely concerns him both as a producer of the article and as the ultimate consumer. It is frequently stated that even among farmers there are more buyers than sellers; as this is true regarding oats and rye, greater care should be taken in their purchase.

STANDARDS PRESCRIBED BY THE REGULATIONS UNDER THE PURE SEEDS ACTS.

THE PROPORTION OR AMOUNT OF FOREIGN INGREDIENTS THAT MAY BE CONTAINED IN A GRADE SEEDS.

Kind of Seeds.	Inert Matter.	Seeds of weeds or seeds of any cultivated plant not included in (A.I.) which will not pass through a metal sieve perforated with round holes 1/4 of an inch in diameter.	Seeds of weeds which will pass through a metal sieve perforated with round holes 1/4 of an inch in diameter.	Seeds of any cultivated plant included under (A.I.) other than seeds of the kind to which the sample purports to belong.	Diseased or Insect-infested Seeds.	Dead and Non-germinable Seeds.
(A.I)	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Barley	1	1	Nil	1	Nil	10
Oats	1	1	Nil	1	Nil	15
Rice	1	1	Nil	1	Nil	15
Rye	1	1	Nil	1	Nil	10
Wheat	1	1	Nil	Nil	Nil	10
Maize	1	Nil	Nil	Nil	Nil	10

THE PROPORTION OR AMOUNT OF FOREIGN INGREDIENTS THAT MAY BE CONTAINED IN B GRADE SEEDS.

Kind of Seeds.	Inert Matter.	Seeds of weeds or seeds of any cultivated plant not included in (B.I.) which will not pass through a sieve perforated with round holes 1/4 of an inch in diameter.	The number of weed seeds which will pass through a metal sieve perforated with round holes 1/4 of an inch in diameter contained in each ounce of the sample of the seeds in question.	Seeds of any cultivated plant included under (B.I.) other than seeds of the kind to which the sample purports to belong.	Diseased or Insect-infested Seeds.	Dead and Non-germinable Seeds.
(B.I.)	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Barley	2	2	10	2	Nil	25
Oats	2	2	10	3	Nil	30
Rice	2	2	5	2	Nil	25
Wheat	2	2	5	2	Nil	25
Rye	2	2	5	2	Nil	25
Maize	2	1	Nil	Nil	Nil	25

Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver, any seeds which contain a larger proportion or amount of foreign ingredients than is prescribed, is guilty of an offence against the Acts.

Samples of any seeds purchased or offered for sale as seed for sowing, may be sent to the Department of Agriculture for analysis. All samples must be drawn from the actual bulk in the sender's possession, and care should be taken to obtain a small quantity from each bag, carefully mixing the portions so obtained, in order to make the sample truly representative of the bulk.

A leaflet giving information as to size of samples and other particulars may be obtained from

The Under Secretary,
Department of Agriculture and Stock, Brisbane.

HORTICULTURAL NOTES.

By E. W. BICK, Curator, Botanic Gardens.

This is quite a busy month in the garden. Dahlias should now be flowering well. Remove all spent blooms to prevent plants seeding, as this lowers their vitality. When cutting flowers for any purpose, take off a fair amount of "wood"; this assists as a pruning. Chrysanthemums should be making good growth. Keep them well staked, and when plants commence to throw up flower stems, liquid manure occasionally will strengthen them, and they will produce better flowers. Towards the end of month put in carnation cuttings, and do not forget that to grow these favourite flowers successfully it is essential to keep raising young plants; the old ones cannot be relied upon. When taking cuttings, it is important to obtain them from healthy plants, as weak or diseased cuttings never develop into really good plants. The growths or side-shoots that are found about half-way up the stems make the best cuttings. Choose well-developed ones, because if too soft they will damp off; on the other hand, when too old and hard at the base they are slow in sending out roots. They should be taken when from 3 to 4 in. long. Remove them with a gentle pull downwards, then trim the base with a sharp knife and cut off the lower leaves. Do not pull them off, otherwise the bark is often injured and the cutting spoilt. The best cuttings usually produce the finest plants. They must not be allowed to lie about when taken off, but should be put in at once. The soil used should be a free, sifted loam and sand in equal parts; if available, a sprinkling of cocoanut fibre dust and powdered charcoal will be of material assistance. The cuttings will also root readily in pure sand. Use small pots, about 5 in.; crock and fill, pressing the compost or sand firmly, then use a dibber to put cuttings in, making sure that the soil is pressed firmly round each cutting. Then water, preferably with a can with a fine rose. They strike best if kept in a sheltered place in a small frame or box away from wind or draughts. Procure a box that will be 2 or 3 in. above the tops of cuttings; the bottom must not be watertight, it may be knocked out altogether. Plunge the pots of cuttings in ashes or cocoanut fibre refuse, and cover top of box with a sheet of glass. The glass should be partly removed each morning and replaced in the evening. Gradually increase the air supply until after about a month, when the glass can be done without altogether, as by then the cuttings should be rooted. When rooted, pot off young plants. Handle carefully, as the young roots are very tender. Make the soil firm, but not hard. Should pots not be available, the cuttings can be struck in a box, but see that you have good drainage; also, if glass is not at hand, use oiled calico or hessian, and keep them from direct rays of the sun. Give a gentle spray of water as required, but do not keep them wet and sodden, but just moist.

This is also the time for the main sowing of sweet peas. Trench or dig your ground deeply, and manure freely (well-decayed cow manure is about the best), and see that you have good drainage, but do not have your plants too close together, as one robs the other. Exercise care in planting seed. Should you have planted too thickly, thin out just before the plants begin to run.

A planting may now be made of bulbs, such as anemone, babianas, freezias, gladioli, ixias, ornithogalums, narcissus, ranunculus, sparaxis, and sprekelia (Jacobea lily). A free soil is necessary for most kinds; fresh manure should never be used, and a place that has been fertilised heavily for a previous crop is suitable. Freezias are very useful, grown in 6-in. pots, as they flower so freely.

A good sowing of seeds for winter flowering plants should now be made, such as antirrhinums, daisies, calliopsis, candytuft, canterbury bells, carnation, marguerite, dianthus, delphiniums, hollyhocks, hunnemannia, larkspur, lobelia, mignonette, pansy, stocks, phlox drummondi, verbenas, wallflowers, and poppies, including the Iceland variety. This last has rapidly come to the front in the Southern States as a florists' flower; they are exceptionally useful for decorative purposes, lasting when cut for quite a long time. Plant the seed as early as possible.

SEED WHEAT FOR DISPOSAL.

Better and more reliable varieties of wheat, higher average yields per acre, and a generally improved standard in the milling quality of grain have latterly done much towards increasing the popularity of this crop and placing Queensland in the position of being fully able to meet her own requirements and have a small surplus for export purposes.

After experimenting and testing several varieties, many growers have already chosen those which suit their respective requirements. Others, apparently, are not fully alive to the advantages to be gained by systematic effort of this character.

It is recognised in practice that no single variety of wheat combines all the essentials required to meet the varying conditions of soils, seasons, and climatic conditions under which grain is produced; consequently it follows that a close study of the characteristics of individual varieties and the testing of new and improved wheats is a medium whereby growers can improve their own position, and that of the industry generally.

Reference was made in the January number of this journal to the fact that, as a result of the Department's efforts in the breeding and selection of wheats for Queensland conditions, approximately 1,000,000 bushels of grain from this source were harvested in 1920.

Wheatbreeding work and the testing of highly improved strains are still being carried on in an endeavour to produce rust-resisting and dependable varieties for the betterment of this industry in our State.

Pure-graded seed of several kinds (in not less than 1-bushel nor more than 9-bushel lots) is being offered for sale this season at 7s. 6d. per bushel, railage paid to the purchaser's nearest railway station.

Orders for any of the varieties (referred to in the letterpress of this issue) should be sent to the Under Secretary for Agriculture and Stock, Brisbane, accompanied by the necessary remittance.

Applications will be treated according to priority of order, but a second choice should be made from the list of varieties being offered. Where stocks of any particular variety of grain have been absorbed by previous orders, the Department will substitute another variety resembling it, unless specifically advised not to do so.

As none of the grain has been "pickled" for the prevention of smut (bunt), prospective growers are recommended to treat their seed wheat with bluestone and lime, according to the usual formula.

DIRECTIONS FOR PICKLING WHEAT (BLUESTONE AND LIME TREATMENT).

Mix 1 lb. of bluestone* or copper sulphate with 5 galls. of water in a wooden or glazed earthenware vessel. Suspend bluestone in a bag just below surface of water and leave overnight.

Iron or metallic vessels are not suitable for bluestone mixture.

A hogshead is to be preferred, sawn into halves.

Rig up a fork and lever alongside of tub to facilitate lifting of wheat in and out of tub.

Use open-mesh jute bag (bran bag) for dipping.

The secret of dipping is the rapid and even dipping of each grain, and, to secure this, agitate the grain by stirring whilst in the pickling mixture.

Three minutes is sufficient for dipping, after which the bag should be allowed to drain on two pieces of scantling, allowing the drainings to run into the pickling tub.

Lime solution—

Quicklime, 2½ lb.

Slack lime, with sufficient water to reduce to consistency of cream, placed in one of the half-casks for the purpose, and add up to 22 galls. of water.

Transfer wheat from bag in which it was dipped in bluestone mixture to a similar open-meshed bag, and dip in lime solution for two minutes.

Drain and dry thoroughly by spreading in thin layers on bags or tarpaulins.

To prevent re-infection of grain—

Dip all bags used for conveying seed after pickling in bluestone mixture, and dry in the open.

If dried out thoroughly after pickling, grain may be kept for some weeks before sowing.

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* The current wholesale quotation for bluestone in Brisbane is 60s. per cwt.—ED.

1. An Established Queensland Variety.

2. An Established Queensland Variety.

3. Unnamed Crossbred.

Amby.

Bunge, No. 1.

Bunge–Indian Pearl Cross, Selection 4.

Plate 28.

4. UNNAMED CROSSBRED.

5. UNNAMED CROSSBRED.

6. UNNAMED CROSSBRED.

BUNGE–INDIAN PEARL CROSS, SELECTION 9.

BUNGE–MANITOBA CROSS, SELECTION 5.

BUNGE–MANITOBA CROSS, SELECTION 7.

PLATE. 29.

7. UNNAMED CROSSBRED. 8. CEDRIC. 9. INGLEWOOD.

BUNGE–MANITOBA CROSS, SELECTION 9. BUNGE–CEDAR CROSS. BUNGE–FEDERATION CROSS, SELECTION 33.

PLATE 30.

10. GUNDI. 11. PUSA NO. 4. 12. PATRIOT.

BUNGE–FEDERATION CROSS, SELECTION 37. IMPORTED INDIAN VARIETY. BUNGE–DURHAM CROSS, SELECTION 57.

PLATE 31.

Name or Stud Number.	Period Recommended for Sowing	Characteristics.						Remarks.
		Stools.	Flag.	Straw when Ripe.	Ear.	Grain.	Rust Resistance.	
1. Amby	May	Well ..	Medium amount	Of medium tallness and stoutness; not inclined to lodge	Bald; white chaff; holds grain well	Plump, shotty medium hard, semi-translucent	Good ..	Established good milling and main crop variety; adaptable to both light and heavy soils. Suitable for all grain districts. Yields of 36 bushels per acre obtained in Maranoa district last year.
2. Bunge No. 1 ..	Middle of May to third week in June	Light ..	Light ..	Of medium tallness, tough, somewhat slender, inclined to lodge if crop rank	Bald; white chaff; holds grain fairly well	Above medium size; hard, translucent	Good ..	Established, good general purpose variety; suitable for chief grain districts. Will thrive on heavy soils, but is more suited to those of a lighter class.
3. B. x I.P. 4 (Bunge and Indian Pearl Cross)	Middle of May to third week in June	Light ..	Light ..	Of medium height, slender, willowy, inclined to lodge if crop rank	Bald; light brown chaff; holds grain fairly well	Medium size, plump, reddish coloured; hard; bright; thin skin	Fair ..	Yielded 25 bushels to the acre in Jandowae district. More suited to light than to heavy soils.
4. B. x I.P 9 (Bunge and Indian Pearl Cross)	Middle of June ..	Light ..	Light ..	Resembles B. x. I.P. 4, but stands up better against heavy winds	Bald; white chaff; holds grain well	Medium size, rice-like; somewhat narrow, hard, bright, attractive grain	Fairly good	Yielded 28½ bushels to the acre in Bell district; has averaged over 24 bushels per acre at Roma State Farm. Suited for chief grain-growing districts, preferably on light soils, and is of a quick-maturing habit.
5. B. x M. 5 (Bunge and Manitoba Cross)	Early in May ..	Well ..	Medium amount	Tough; of medium tallness and stoutness; erect habit, not inclined to lodge	Bald, flattened, attractive looking; white chaff, holds grain well; prolific type	Red, medium, plump, attractive grain of medium hardness	Good ..	Yielded 27 bushels in Inglewood district. Good milling variety; suitable for main crop sowing; stands up well on black soils.
6. B. x M. 7 (Bunge and Manitoba Cross)	Early in May ..	Well ..	Medium amount	Tough; of medium tallness and stoutness; erect habit, not inclined to lodge	Bald, flattened, slightly tapering; white chaff, holds grain well	Medium size; bright, plump, attractive grain, fairly hard; smooth, thin skin	Good ..	Yielded 28¾ bushels per acre at Inglewood. Good milling variety. Thrives well on black soils; a good saleable type of grain.

Name or Stud Number.	Period Recommended for Sowing.	Characteristics.						Remarks.
		Stools.	Flag.	Straw when Ripe.	Ear.	Grain.	Rust Resistance.	
7. B. x M. 9 (Bunge and Manitoba Cross)	Early in May ..	Fair ..	Medium amount	Tall growing; of medium stoutness; fairly erect habit, but inclined to lodge if rank	Bald, smooth, tapering; white chaff; holds grain moderately well	Long, narrow pointed; dull red, somewhat starchy grain, softer than B. x M. 5	Fairly good	Yielded 25⅕ bushels per acre at Inglewood. Thrives fairly well on black soils.
8. Cedric (Cedar and Bunge Cross)	Middle of May to second week in June	Fair ..	Light ..	Of medium tallness, somewhat slender; tough, willowy; not inclined to lodge	Bald; faint reddish tinged chaff; holds grain fairly well	Medium size, full-bosomed, dull red colour; of medium hardness	Good ..	Yielded 30 bushels at Roma State Farm and 30 bushels at Inglewood; attractive class of grain; good milling quality, suitable for main crop sowing on a variety of soils.
9. Inglewood (Bunge and Federation Cross)	Early in May ..	Well ..	Abundant	Not tall; stiff, erect habit; of medium stoutness, somewhat soft	Bald; reddish coloured, holds grain well	Medium size; amber coloured grain, of medium hardness	Fair ..	Prolific yielder under favourable conditions, over 37 bushels at Inglewood. Suitable for South-Western districts, more so than on the Downs
10. Gundi (Bunge and Federation Cross)	Early in May ..	Well ..	Abundant	Not tall; stiff, erect habit; of medium stoutness, somewhat soft	Bald; smooth, light brown in colour, holds grain well	Medium size, somewhat rough skin, white in colour	Fair ..	Prolific yielder under favourable conditions, over 37 bushels at Inglewood. Suitable for South-Western districts, more so than on the Downs.
11. Pusa No. 4 (Indian)	Late May and early in June	Fair ..	Medium	Medium height and stoutness; erect habit, not inclined to lodge	Bald; velvet chaff, holds grain well	Medium size, plump, bright, hard, translucent grain	Good ..	Yielded 32 bushels at Roma State Farm and 24 bushels at Allora. Suitable for main crop sowing on both light and heavy soils.
12. Patriot (Bunge and Durum Cross)	May	Fair ..	Medium	Medium height and stoutness; erect habit, not inclined to lodge	Tapering; bald, white chaff; holds grain well	Short, plump, dull yellow; starchy	Good ..	Yielded 28¾ bushels at Roma State Farm. Has also given satisfactory results in the South-Western districts.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1922.

Extremely hot weather was again experienced during January, which considerably upset the laying. On the 29th of the month 110 deg. were registered inside the buildings on the poultry section. One death occurred through heat apoplexy (H. Chaille's "E" Black Orpington). Several of the birds are now in moult. T. Fanning's White Leghorns again head the list with a score of 155 eggs for the month. The feeding of the birds was not as good as one would care to see it, but the loss of appetite may be accounted for by the trying weather conditions. Following are the individual records:—

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	142	1,337
*W. and G. W. Hindes	Do.	132	1,317
*T. Fanning	Do.	155	1,286
*Mrs. R. Hodge	Do.	136	1,285
*H. Fraser	Do.	135	1,250
R. Gill	Do.	99	1,241
*C. M. Pickering	Do.	108	1,182
*Geo. Trapp	Do.	86	1,176
Oakleigh Poultry Farm	Do.	119	1,173
F. Birchall	Do.	103	1,171
*W. Becker	Do.	111	1,143
*R. C. J. Turner	Do.	114	1,130
*H. C. Towers	Do.	93	1,127
*Thos. Eyre	Do.	108	1,125
R. C. Cole	Do.	97	1,119
*Thos. Taylor	Do.	117	1,118
H. C. Thomas	Do.	74	1,117
*C. Goos	Do.	124	1,111
W. A. Wilson	Do.	96	1,108
Mrs. E. White	Do.	118	1,097
*J. W. Newton	Do.	86	1,096
*S. L. Grenier	Do.	111	1,086
*E. Chester	Do.	105	1,081
*Mrs. L. Anderson	Do.	120	1,076
Bathurst Poultry Farm	Do.	112	1,076
*E. A. Smith	Do.	107	1,075
J. W. Short	Do.	118	1,072
*G. W. Williams	Do.	111	1,070
M. F. Newberry	Do.	90	1,060
H. Stacey	Do.	107	1,046
*B. Chester	Do.	90	1,045
W. Barron	Do.	93	1,044
*H. P. Clarke	Do.	125	1,033
*Haden Poultry Farm	Do.	110	1,031
O. C. Goos	Do.	90	1,006
Mrs. E. Z. Cutcliffe	Do.	80	968
Linquenda Poultry Farm	Do.	100	954
E. Stephenson	Do.	83	953
W. M. Glover	Do.	81	910
Brampton Poultry Farm	Do.	76	898
*W. and G. W. Hindes	Brown Leghorns	53	894

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	103	1,293
*R. Burns	Do.	113	1,269
*T. Hindley	Do.	121	1,239
*A. E. Walters	Do.	119	1,237
W. Becker	Langshans	120	1,235
*Parisian Poultry Yards	Black Orpingtons ...	129	1,215
*C. C. Dennis	Do.	116	1,183
*Jas. Ferguson	Chinese Langshans ...	81	1,164
Geo. Muir	Black Orpingtons ...	102	1,141
*E. Morris	Do.	103	1,139
Rev. A. McAllister	Do.	86	1,138
Jas. Ryan	Rhode Island Reds ...	89	1,133
*E. F. Dennis	Black Orpingtons ...	98	1,111
Jas. Every	Langshans	91	1,081
*J. Cornwell	Black Orpingtons ...	92	1,079
*N. A. Singer	Do.	101	1,077
Jas. Potter	Do.	57	1,055
*R. Holmes	Do.	114	1,034
*J. E. Smith	Do.	116	1,032
*E. Stephenson	Do.	94	1,001
*H. M. Chaille	Do.	96	996
*E. Oakes	Do.	113	995
*A. Shanks	Do.	85	995
G. Cumming	Do.	91	988
*Mrs. G. Kettle	Do.	96	981
J. W. Newton	Do.	85	949
F. Harrington	Rhode Island Reds ...	84	900
T. C. Hart	Black Orpingtons ...	90	846
Total	...	7,100	75,591

* Indicates that the pen is being single tested.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	212	227	247	215	249	187	1,337
W. and G. W. Hindes (W.L.) ..	231	206	217	234	228	201	1,317
T. Fanning	235	206	230	201	205	209	1,286
Mrs. R. Hodge	213	214	236	220	224	178	1,285
H. Fraser	244	180	219	214	211	182	1,250
C. M. Pickering	219	200	204	178	210	171	1,182
Geo. Trapp	211	188	211	189	196	181	1,176
W. Becker	213	211	178	177	211	153	1,143
R. C. J. Turner	190	179	185	181	191	204	1,130
H. C. Towers	202	179	189	155	174	228	1,127
Thos. Eyre	201	184	151	193	208	188	1,125
Thos. Taylor	189	187	184	160	174	224	1,118
C. Goos	194	202	161	146	163	245	1,111
J. W. Newton	190	203	211	189	128	175	1,096
S. L. Grenier	175	208	156	188	185	174	1,086
E. Chester	205	178	162	177	174	185	1,081
Mrs. L. Anderson	187	194	170	174	190	161	1,076
E. A. Smith	217	164	198	183	175	138	1,075
G. Williams	239	194	151	154	175	157	1,070
B. Chester	145	163	204	179	187	167	1,045
H. P. Clarke	222	142	179	145	186	159	1,033
Haden Poultry Farm	113	175	192	190	175	186	1,031
W. and G. W. Hindes (B.L.) ..	133	162	137	116	139	207	894

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	159	193	258	194	218	247	1,269
T. Hindley	223	213	225	169	194	215	1,239
A. E. Walters	238	213	201	200	186	199	1,237
Parisian Poultry Farm	213	200	197	264	151	190	1,215
C. C. Dennis	196	179	179	220	207	202	1,183
J. Ferguson	187	180	186	224	197	190	1,164
E. Morris	208	197	140	210	190	194	1,139
E. F. Dennis	173	201	178	174	185	200	1,111
J. Cornwell	158	187	176	198	164	196	1,079
N. A. Singer	190	173	179	181	163	191	1,077
R. Holmes	146	183	181	183	201	140	1,034
J. E. Smith	222	238	163	124	145	140	1,032
E. Stephenson	201	161	180	178	125	156	1,001
H. M. Chaille	126	180	176	201	171	142	996
E. Oakes	160	170	170	190	147	158	995
A. Shanks	138	165	176	178	151	187	995
Mrs. G. Kettle	160	190	213	110	147	161	981

CUTHBERT POTTS,
Principal.

CANE PEST COMBAT AND CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 17th February, 1922) from the Entomologist, Mr. E. H. Jarvis:—

"In the course of the past month our time has been largely occupied with very necessary laboratory work in connection with certain methods of control to be directed this season against second and third stage grubs of the cane-beetle *Lepidoderma albohirtum.*

"Initial experiments with miscellaneous preparations, conducted by the writer last November, led to the discovery of two substances that appear well worthy of investigation. These will be thoroughly tested and the results reported later on.

"I have already pointed out that although ideal methods of combating this insect are admittedly those in which we succeed best in preventing oviposition by destroying as many egg-laden female beetles as possible, the greater length of the grub stage compensates to some extent for its secondary importance, since it admits of the practice of control measures throughout a period of about six months, while the sphere of action of this pest underground is greatly restricted.

"OUR FIGHT AGAINST ANTS AND VEGETABLE PARASITES.

"Allusion has been made from time to time in these reports to a small black ant (*Pheidole megacephala*) which occurs freely in most canefields, where it does good service by destroying caterpillars of moth-borers, &c. In the laboratory and insectary, however, where its presence is anything but desirable, it proves a continual source of annoyance. In one of our large cages, for example, built recently for rearing tachinid-fly parasites, the legs were stood, as usual, in pans of water, and before planting the canes containing borer grubs the soil (about 36 cub. ft.) was twice fumigated with carbon bisulphide, and the surface afterwards treated with boiling water. This answered for a time only, until the swarming period occurred, when a few of the winged female ants flew unobserved on to the sides of the cage, and crawling between the boards invaded the forbidden soil, forming colonies consisting of thousands of individuals, which a week or so later were found to have taken complete possession, and to be actually nesting in some of the bored canes. This voracious little ant will devour, alike, leaf-feeding caterpillars and other insects, household foodstuffs of any kind, or newly hatched featherless birds. It is supposed to be a native of Mauritius, but is now of world-wide distribution.

"In spite of such drawbacks, fully 200 tachinid flies, intended for distribution at Babinda and South Johnstone, emerged in this cage towards the end of December. Unfortunately, however, a spell of wet weather lasting about a fortnight set in at this time, establishing climatic conditions eminently favourable to the development of a certain fungus (*Empusa* sp.) which straightway attacked these parasites.

"Most people have occasionally noticed house flies when killed by *Empusa muscæ* sticking, as if glued, to a window pane, with wings and legs fully extended and the body swollen, yellowish, and mouldy-looking. Tachinid flies exhibiting this characteristic appearance were found each day adhering to the sides of the cage (mosquito netting) and to leaves of shade plants, &c. In a week or less this vegetable parasite had accounted for more than 50 per cent. of the flies.

"This fungus doubtless operates as a controlling factor in canefields during the wet season, probably affecting broods of flies emerging between December to February.

"FUMIGATING CANE GRUBS.

"The question of machine treatment for administering bisulphide of carbon in canefields is still receiving consideration. Mr. Dawson's machine was submitted to a field test last November, but did not prove satisfactory. A continuous flow of bisulphide was administered from one side of an iron tooth drawn through the soil. In the first trial no provision was made for filling in the furrow left by this tooth, or consolidating the soil above the line of injection by some downward pressure. The bisulphide, being left in loosened-up earth which was dry overhead, doubtless escaped upwards during the ordinary course of evaporation of the moisture. Mr. Dawson deserves credit for being the first, I believe, to attempt machine treatment for the fumigation of cane grubs; such pioneering work is always commendable.

"Some of the growers here are applying bisulphide this season by means of the "Danks injector." The following hints on the use of this fumigant may be found useful:—

(1) Injections in light soils among young plant cane should not be made closer than about 6 in. from the plants, and 18 in. apart; and need only be applied on one side of a line of stools.

(2) Injections made during high temperatures or when the soil is too dry may injure or kill young cane.

(3) Fumigation should *not* be carried out at a time when the ground is dry or cracked, or when its porosity is closed by excess of moisture.

(4) In red, volcanic country the soil is generally open and in good condition for treatment a few days after heavy rain, as the surface, being then caked, prevents escape of the bisulphide fumes, and all that is necessary is to close the holes made by injections.

(5) Sandy soils are in fair condition for treatment after a light rain.

(6) Do not cultivate the soil for a week or so after treatment.

(7) An application of carbon bisulphide greatly improves exhausted soils, and destroys certain injurious bacteria.

(8) Before application, examine the roots of a few stools to find depth at which the grubs are working, and then arrange things so that injections will be made an inch or two above them.

"LONGEVITY OF THE GREY-BACK COCKCHAFER.

"In view of the fact that growers here appear to be uncertain regarding the length of life of our principal cane-beetle (*Lepidoderma albohirtum*), it may be well to mention that recent investigations by Labitte, who has made a special study of the longevity of beetles, has supplied us with valuable data in this connection. In his table giving the maximum period of existence for no less than forty-eight different species of coleoptera in captivity, we find that a tenebrionid beetle (*Blaps gigas*) lived 3,349 days, the lives of nine other species being found to vary from 1,005 to 1,219 days. An additional thirty-three beetles, belonging to different genera, had a maximum longevity of from 114 to 989 days, while the shortest life period among all these forty-eight beetles was found to be that of the common European cockchafer (*Melolontha melolontha*), an insect closely allied to our own cane-beetle, and of similar habits, which lived only thirty-one days. During the past seven years I have repeatedly found that captured specimens of albohirtum, taken just after emergence, do not live longer than from three to four weeks, even when kept under the most favourable conditions. It is interesting to note that the period of longevity in our own species happens to coincide with that of the European cockchafer.

"A NEW DIGGER-WASP PARASITE OF THE GREYBACK CANE-BEETLE.

"I have pleasure in recording *Scolia formosa* Guer, as being parasitic on the grubs of our cane-beetle (*Lepidoderma albohirtum* Water).

"This discovery was made in May, 1920, when the writer, chancing to obtain a female of this handsome digger-wasp at Gordonvale, succeeded in working out its life-history. This specimen, which lived just eight weeks in confinement, laid twenty-four eggs on grubs of albohirtum, but refused to oviposit on those of *Lepidiota frenchi*.

"Only eleven cocoons were obtained, the remaining eggs having been destroyed by mites and other enemies. The life-cycle occupied 108 days, three being taken up by the egg stage, eleven by the maggot condition, and ninety-four by the cocoon stage. *Scolia formosa*, which is about the size of our common digger-wasp *Campsomeris tasmaniensis*, is mostly black, broadly banded on the abdomen with reddish-orange, while the thorax, legs, and head are rather densely clothed with reddish hairs. The egg differs from that of Campsomeris in being shorter and proportionately broader; and the larva, when about three-sixteenths of an inch long, is shining, smooth, pale greenish-yellow.

"*S. formosa* is rather a rarity in this district, so may be very subject to attacks from hyperparasites. In view of the fact that it occurs in other countries, so probably has acquired a habit of frequenting quite a number of different honey-bearing flowers, it seems likely that our 'feather-horn' beetle (*Macrosiagon pictipennis* Lea), which is hyperparasitic on Campsomeris wasps, may find *formosa* a readily accessible host."

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR DECEMBER, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
College Evening Glow	Jersey ...	10 Oct., 1921	855	5·6	57·45	
Auntie's Lass ...	Ayrshire ..	31 Oct. ,,	982	4·7	55·00	
Hedges Madge ...	Holstein ...	15 Aug. ,,	1,017	4·3	52·47	
Iron Plate	Jersey ..	12 July ,,	981	4·4	51·79	
Thyra of Myrtle-view	Ayrshire ...	31 July, ,,	1,246	3·7	51·45	
Prim	Holstein ...	9 Mar. ,,	1,221	3·6	48·80	
College Mignon ...	Jersey ...	7 July ,,	793	5·0	47·58	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	729	5·0	43·74	
College St. Margaret	Jersey ...	25 Sept. ,,	776	4·6	42·83	
Bellona	Ayrshire ...	26 June ,,	902	4·0	40·28	
Yarraview Snow-drop	Guernsey ...	14 Oct. ,,	639	4·8	36·80	
College Bluebell ...	Jersey ...	22 Oct. ,,	730	4·5	35·42	
Miss Security ...	Ayrshire ...	20 Aug. ,,	1,030	3·1	35·13	
Buttercup	Shorthorn...	28 Oct. ,,	947	3·2	33·52	
College Prima Donna	Holstein ...	17 Nov. ,,	936	3·2	33·17	
Nina	Shorthorn...	11 Nov. ,,	764	3·8	32·18	
Miss Betty ...	Jersey ...	7 July ,,	588	4·2	29·63	
Netherton Belle ...	Ayrshire ...	30 Nov., 1920	451	5·4	29·22	
Sweet Meadows ...	Jersey ...	31 Oct., 1921	416	5·3	28·45	
College Cold Iron	,, ...	10 Mar. ,,	484	4·8	27·92	
Glow VI.	Guernsey ...	28 Aug. ,,	675	3·7	27·58	
College Meadow Sweet	Holstein ...	17 May ,,	478	4·8	27·53	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	397	5·5	26·32	
Little Buttercup...	Holstein ...	12 Dec., 1921	804	2·7	26·04	
Miss Fearless ...	Ayrshire ..	26 May ,,	515	4·2	25·98	
College Cobalt ...	Jersey ...	6 Jan. ,,	420	5·0	25·20	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	370	5·5	24·36	
Comedienne ...	Jersey ...	26 Nov., 1920	381	5·2	23·77	
College Grandeur	,, ...	29 Dec. ,,	381	5·0	22·81	
Hedges Dutchmaid	Holstein ...	26 May, 1921	462	4·0	22·17	
College Sunrise ...	Jersey ...	12 June ,,	376	4·9	22·10	
Rosine	Ayrshire ..	19 Jan. ,,	523	3·8	22·01	
College Desire ...	,, ...	16 Nov. ,,	405	4·5	21·87	
Lady Amy ...	,, ...	27 June ,,	391	4·5	21·11	
Thornton Fairetta	Jersey ...	15 Mar. ,,	322	5·4	20·86	
Hedges Nattie ..	Holstein ...	26 Feb. ,,	475	3·9	20·65	
College Wildflower	Jersey ...	10 Dec. ,,	390	4·4	20·59	

Rainfall, 760 points.

MILKING RECORDS OF COWS FOR JANUARY, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Auntie's Lass ...	Ayshire ...	31 Oct., 1921	1,093	4·7	62·00	
College Evening Glow	Jersey ...	10 Oct. ,,	860	5·6	57·79	
Iron Plate ...	,, ...	12 July ,,	1,043	4·4	55·00	
Hedges Madge ...	Holstein ...	15 Aug. ,,	992	4·3	51·18	
Lute	Ayrshire ...	8 Jan., 1922	846	4·9	49·74	
Thyra of Myrtleview	,, ...	31 July, 1921	1,180	3·7	48·57	
College Mignon ...	Jersey ...	7 July ,,	796	5·0	47·76	
Prim	Holstein ...	9 Mar. ,,	1,150	3·6	46·00	
College Bluebell ...	Jersey ...	22 Oct. ,,	845	4·5	43·23	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	729	5·0	43·20	
Little Buttercup ...	Holstein ...	12 Dec. ,,	1,352	2·7	42·89	
Lady Mitchell ...	,, ...	20 Dec. ,,	1,135	3·4	42·52	
College St. Margaret	Jersey ...	25 Sept. ,,	766	4·6	42·28	
Buttercup	Shorthorn...	28 Oct. ,,	1,153	3·2	40·64	
Bellona	Ayrshire ...	26 June ,,	893	4·0	40·10	
Netherton Belle ...	,, ...	30 Nov., 1920	599	5·4	38·81	
College Wildflower	Jersey ...	10 Dec., 1921	729	4·4	38·49	
Nina	Shorthorn ..	11 Nov. ,,	871	3·8	36·84	
Sweet Meadows ...	Jersey ...	31 Oct. ,,	528	5·7	36·11	
College Meadow Sweet	Holstein ...	17 May ,,	627	4·8	36·11	
Yarraview Snowdrop	Guernsey ...	14 Oct. ,,	620	4·8	35 71	Rainfall, 229 points.
Miss Betty ...	Jersey ...	7 July ,,	704	4·2	35·48	
Miss Security ...	Ayrshire ..	20 Aug. ,,	1,007	3·1	34·31	
College Prima Donna	Holstein ...	17 Nov. ,,	932	3·2	32·51	
College Promise ...	Jersey ...	6 Jan., 1922	639	4·2	32·20	
Miss Fearless ...	Ayrshire ...	26 May, 1921	632	4·2	31·85	
Dawn of Warragaburra	Jersey ...	15 Oct., 1920	463	5·5	30·55	
Glow VI.	Guernsey ...	28 Aug., 1921	741	3·7	30·46	
Comedienne ...	Jersey ...	26 Nov., 1920	482	5·2	30·07	
College Cobalt ...	,, ...	6 Jan., 1921	508	5·0	30·00	
College Sunrise ...	,, ...	12 June ,,	506	4·9	29·40	
College Desire ...	Ayrshire ...	16 Nov. ,,	529	4·5	28·32	
College Grandeur..	Jersey ...	29 Dec., 1920	443	5·0	26·58	
Lady Annette ...	Ayrshire ...	2 Jan., 1922	384	2·5	26·52	
Fair Lassie ...	,, ...	19 Oct., 1921	388	5·2	24·21	
Thornton Fairetta	Jersey ...	15 Mar. ,,	371	5·4	24·04	
Rosine	Ayrshire ...	19 Jan. ,,	558	3·8	23 71	
Hedges Nattie ...	Holstein ...	26 Feb. ,,	536	3·9	23·50	
Confidante ...	Ayrshire ...	12 May ,,	553	3·8	23·28	
Hedges Dutchmaid	Holstein ...	26 May ,,	520	4·0	23·24	
College Cold Iron	Jersey ...	10 Mar. ,,	403	4·8	23·04	
Lady Amy ...	Ayrshire ...	27 June ,,	442	4·5	22·86	
Confidence ...	,, ...	8 Feb. ,,	446	4·2	22·47	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	336	5·5	22·17	
Mistress May ...	Ayrshire ...	3 Dec. ,,	674	3 0	22·06	
Charming Damsel	,, ...	12 May ,,	519	3·8	22·01	
Magnet's Leda ...	Jersey ...	6 Oct., 1920	401	4·4	21·17	

ELECTRICITY FROM WATERWORKS.

An English city has developed quite an interesting scheme for utilizing water power afforded by its reservoirs. It recently extended its waterworks system, and in order to provide electrical power for operating the ropeways, crushers, cranes, and other machinery required in the construction of a dam, it arranged a water turbine installation driven from the existing reservoir. The water, after it has done its work in the turbine and generated its electricity, is returned to the water-supply system. Not only was sufficient power generated for the purposes already mentioned, but enough was produced to light a village and the residences of the staff engaged on the work.

PLASTIC WOOD.

The name "Plastic Wood" is given to an extraordinarily interesting material recently introduced by a British firm. It is made of very fine wood meal mixed with collodion so as to become of the consistency of soft putty. It can be used for filling and stopping holes in wood, as it is exceedingly tenacious and adheres firmly to woods of all qualities. One of its most valuable applications is in the making of patterns for casting purposes. It can be built up into any form and it sets quite hard, so that it can be cut like ordinary wood or turned in the lathe. It has the valuable quality of being waterproof, and it does not warp or deteriorate through damp. Plastic wood can also be finished with sandpaper in the ordinary way, giving a highly glazed finish. Nails can be driven firmly into it without cracking it. Perhaps the only drawback is that its adhesive qualities are so marked that it sticks on the hands of anyone using it. The manufacturers, however, supply a special solvent which enables it to be thoroughly cleaned off the hands.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 9.

WHITE MYRTLE (*Rhodamnia argentea*).

Derivation.—*Rhodamnia,* from Greek *rhodamnos,* a young branch (probably alluding to the slender branchlets of the first species so named; *argentea,* Latin, silvery (referring to the silvery under-surface of the leaves).

Description.—A tree attaining a height of 100 ft. and a barrel diameter of nearly 3 ft. Barrel often channelled and slightly flanged at the base. Bark reddish-brown or grey, finely fissured; often flakey in the channels of the barrel; when cut, dark brown, varying from ⅛ to ¼ in. thick on a tree with a barrel diameter of 2 ft. 9 in. Sapwood pale-brown to yellow. Young shoots and underside of leaves covered by a more or less dense, white, silvery, powder-like fluff. Leaf stalks 1/6 to ⅓ in. long. Leaves opposite, egg-shaped, lance-shaped, or elliptical in outline, tapering, or sometimes nearly rounded at the base, blunt or protracted into a long point at the apex, the midrib and a curved lateral nerve on each side of it prominent on both surfaces; the nerves diverging from the midrib and the net veins are more conspicuous on the under-surface. Measurement of leaf-blade 2 to 3½ in. long, two to three times as long as broad. Flowers in small bunches (cymes) in the forks of the leaves, two to four stalks springing from each fork; each stalk measures from ¼ to ½ in. long and bears three flowers, the central one of which is sometimes without a stalklet, whilst the flower on each side has a stalklet about ⅛ in. long. The lowermost part of the flower (the calyx) is about 3/16 in. in diameter; its lower part is cup-shaped, and its upper part divided into four oval lobes about 1/10 in. long. Alternating with the calyx lobes are four white, broadly oval petals about ⅛ in. long. On the inside of the petals are numerous (over twenty) bristle-like stamens about 1/6 in. long. The ovary fills the cup-shaped part of the calyx, with which it is united, and tapers into a slender style about ¼ in. long. Fruit globular, black, about ⅓ in. in diameter, the outer fleshy part enclosing one, two, or more hard, smooth, yellowish seeds.

Flowering period irregular.

Distribution.—Confined to Australia. Coastal scrubs from the Clarence River to Baffle Creek (north of Bundaberg); National Park; ranges about Killarney and Blackall Range.

Uses.—The timber should be useful for general building work, indoor fittings, and cabinet-making. Mr. R. T. Baker, quoting C. W. Chapman, states that it could be used for carriage, wagon, and wheelwrights' work, boot lasts, gun stocks, and golf clubs. He also states that it could be tried for woodworking planes.

References.—*Rhodamnia argentea,* Bentham, "Flora Australiensis," vol. III., p. 278; F. M. Bailey, "Queensland Flora," part II., p. 653.

Photo. by the Authors.]

PLATE 32.—THE WHITE MYRTLE (*Rhodamnia argentea*), Ranges eastward of Emu Vale, Killarney District.

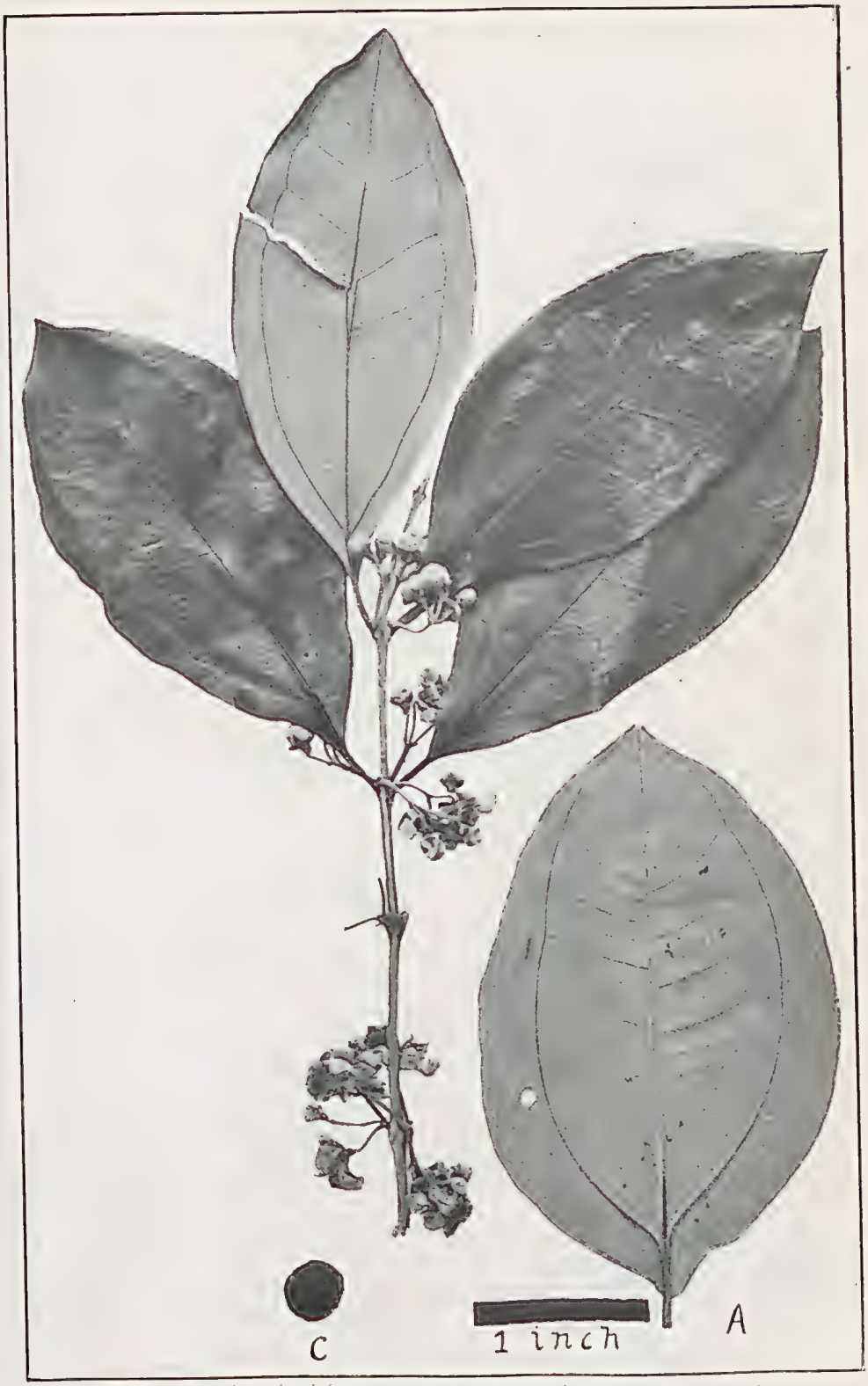


Plate 33.—White Myrtle (*Rhodamnia argentea*).
A. and B.—Underside and variation in shape of leaves. C.—Fruit.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

BROWNEA GRANDICEPS.

NATURAL ORDER LEGUMINOSÆ.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—From "Botanical Magazine," 4859 (1845):—"*Brownea* named in honour of Dr. Patrick Browne, M.D., of County Mayo, Ireland (born 1720), practised medicine in London for a time, and afterwards in the West Indies (first in Antigua, and then in Jamaica), was a correspondent of Linnæus, and keenly interested in Botany; did a lot of collecting; published his valuable 'Civil and Natural History of Jamaica' in 1756. *Grandiceps*, large-headed."

Description.—A tree, said to grow 60 ft. high in its native habitat (Nicholson's "Dictionary of Gardening," vol. I., 215). In the Gardens it is a large spreading shrub about 25 ft. in diameter and about 16 ft. high, forming no trunk of any height, the branches commencing within a few inches of the ground.

Leaves.—Large, from 9 to 18 in. in length, drooping, alternate, abruptly pinnate; pinnæ from nine to fourteen pairs, from 3 to 5 in. long, upon very short petiolules, and extending the whole length of the very downy ferruginous petiole; they are alternate, oblong, lanceolate, entire, obtuse at base, sharply acuminate; lower pinnæ cordate, with a narrow point fully half the entire length. The new growth at ends of branches, usually of eight or nine leaves, is drooping and flaccid, of a delicate pale-green colour, mottled with light-brown splashings; the latter disappears as the leaves harden, the general appearance of the new growth being somewhat like that of long racemes of flowers.

Flowers.—Large, rosy-red, exceedingly numerous, forming a dense pendant globe; the flowers open from centre, and the older ones on outside fall off; the globe or "head" of flowers is from 6 to 8 in. across, and forms at the downy apex of a branch, usually underneath; well-sheltered with foliage. Individual flowers: Calyx funnel-shaped, in three portions, upper segment longer and deeply two-lobed; petals large, spathulate, lamina obovate, waved claws slender; stamens arising from tube of calyx, as long, or rather longer than the petal; anthers linear, versatile; ovary stipitate, springing from the tube of calyx, linear, oblong, downy; style slender, awl-shaped, exceeding the petals or stamens in length; stigma capitate.

Legumen (Pod).—From 3 to 6 in. long, up to 1¾ in. in breadth, covered with a dense, rusty, brown down, containing from one to three large seeds varying very much in size and shape, some being oblong, others elongated heart-shape, from 1 to 2 in. long and 1 to 1½ in breadth when freshly gathered.

Habitat.—Venezuela, in the mountain regions of Cumanna, Caraccas, and others where it is known amongst the inhabitants as "Rosa Del Monte" (Rose of the Mountains).

Propagation.—From seed (unfortunately our specimen does not seed freely); comparatively few pods form; the seeds germinate readily, and the young plants grow quickly. It being very spreading in growth, an old plant covers a large area of ground.

There is a large plant in the Botanic Gardens, between the centre island pond and the main riverside roadway. It flowers for several months in the year, usually in August, September, and October, and the magnificent, unique heads of brilliant flowers attract universal attention.

There are a number of other species of this fine Genus, all of which are indigenous in South American countries, of which *Brownea coccinea* is the only other species represented in the Gardens. We are endeavouring to obtain seeds of some of the others that are very interesting and beautiful.

PLATE 34.—"BROWNIA GRANDICEPS."

1.—Flower Spike. 2.—Seed Pod and Seeds.

SHEEP ON THE COAST.

By W. G. BROWN, Sheep and Wool Expert.

The old and cherished theory that sheep will not thrive on the coast is gradually being worn down by the success of men who have backed their opinion in a practical try-out. From time to time reports reach us of the successful establishment of small flocks on various parts of the coast, and even on adjacent islands; and the evidence supports the contention that, under right conditions and capable management, sheep of suitable breeds will not only do well but will prove a very profitable side line to general farming in seaboard areas.—ED.

A decided acquisition to the farmers' flocks of Queensland is the one recently established by Mr. Hugh McMartin at Glen Pullen, Pullen Vale, near Indooroopilly. Mr. McMartin has had a long experience among sheep. Prior to going on service with the A.I.F. he was engaged on a grazing venture on the Northern Downs. After discharge from the army he was attracted by the prospect of success in the establishment of a stud nearer the coast, and, after full inquiry, planned accordingly. After travelling up and down the State, he fixed upon Glen Pullen as a property most suited to his purpose. The holding comprises about 500 acres, and is situated within 10 miles of the Brisbane G.P.O. and 7 miles from Indooroopilly. Although but partly improved, enough has been done to show that in time it will become a snug little property, ideally adapted to sheep-farming. The country for the most part is undulating, and the cleared and rung areas are well covered with natural and exotic pastures. Though mostly forest land, there are fairly extensive patches of rich vine scrub, and the valley bottoms contain some excellent arable areas already abundantly productive. Permanent water is provided in creeks and springs.

Mr. McMartin made a start with a small flock of crossbred ewes headed by a purebred Border Leicester ram, and these are doing well. Within the last few months a flock of Dorset Horn ewes and a ram of the same breed (imports from a well-known South Australian stud) have been added. Inspection showed that these sheep are of very great excellence, and since their coming to Queensland they have improved remarkably.

The two flocks are kept apart and are being fed—the first on natural grasses, and the Dorsets partly on indigenous pasture and partly on introduced grasses and cultivated fodders.

The accompanying plate gives some idea of the quality of Mr. McMartin's Dorset Horns and of the country upon which they are running.

CHARACTERISTICS OF THE DORSET HORN.

"Both male and females have horns, those on the males curving backward and around spirally, while those on the ewes curve outward, down, and forward, with tips rising about level with the eye, perhaps turning in slightly. The face, legs, and hoofs are white. The nostrils are also white; face strong, with considerable breadth between the eyes. Compared with the ideal mutton sheep, the neck and body tend to be long and rangy, and there is hardly the spring of rib and levelness of back most desirable. The head should have a short foretop of wool; the back part of the head below the ear should be woolled; and the body generally should be well covered with a fine fleece, extending down to the knees and hocks. The breed is from medium to heavy among the middle-wool breeds. Rams in fair flesh should weigh about 225 lb., and ewes 165 lb.; however, much larger weights are secured."—"*Types and Breeds*" (Plumb).

The foregoing gives an idea of what to look for. The weights given have been exceeded by as much as 100 lb.

Excellent results have been obtained by numerous crossing experiments with the Merino. The cross produces ideal spring lambs much sought after by butchers. Dorsets shear about 9 lb. for rams and 6 lb. for ewes. The quality of the staple is of medium grade, being neither fine nor coarse.

THE SUCCESSFUL MOTOR LORRY.

One of the reasons for the pre-eminence of British motor wagons is that open competitions are held between the different makers every year. A trophy is awarded annually for the most successful performance in any certified trial for a total distance of over 1,000 miles. The successful vehicle at the last trial gave an average running speed of nearly 16 miles per hour, with a consumption of motor spirit of 13 miles to the gallon. The lorry was fully loaded, its total running weight being 5 tons 6½ cwt. The oil consumption worked out at 504 miles per gallon, and throughout the whole of the ten days' trial no adjustments were effected except the cleaning of a choked petrol cock.

Plate 35.—Dorset Horn Sheep on Mr. Hugh McMartin's Property, "Glen Pullen," Pullen Vale.

NEW TYPE OF CONCRETE ROAD.

Concrete roads have become quite familiar in many parts of the world, especially where highways capable of carrying very heavy traffic are required. The making of a satisfactory concrete road is, however, a matter of great skill; and in many cases disappointing results have been achieved. One of the drawbacks of concrete as a road material is that it contracts to a certain extent in setting and also as the temperature falls. Again, when concrete of the usual kind is laid in position, the scum always works to the surface and forms a layer which, when dry, prevents a proper junction being made between different portions of the roadway. The consequence is that cracks appear in the roadway, especially at places where the laying of the concrete has been arrested, as in the case of the end of a day's work. A British road engineer has developed a new method which he claims obviates these difficulties. He lays the concrete in alternate portions and does not fill the intervening spaces until the material in the first portions has set and contracted. Further, he makes the edges of each portion exactly vertical by means of special appliances. This ingenious method results in the roadway being split up into straight, close joints instead of a number of irregular cracks.

COMMERCIAL FRUIT PACKING.

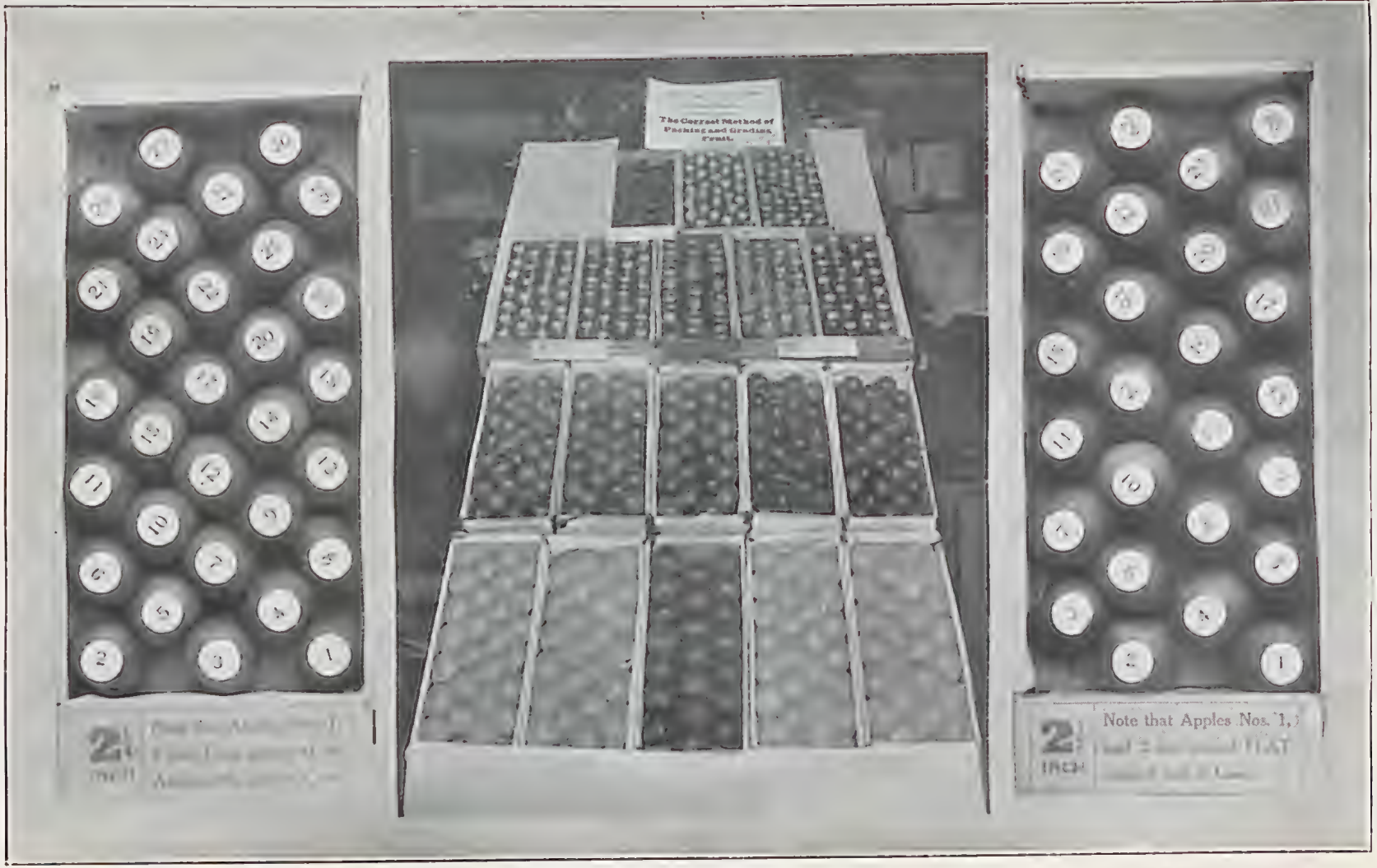
For a considerable time past the Department of Agriculture has been striving, through the Journal and other media, to impress Queensland fruitgrowers with the necessity of the utmost efficiency in picking and packing their products. An awakened public opinion among orchardists on the Granite Belt led to the expression of a strong desire for instruction in improved methods, and this was met by the State Government with an arrangement with the Tasmanian Ministry of Agriculture for the loan of the services of an expert packer. In placing the time and experience of Mr. W. Rowlands, a valued departmental officer, at the disposal of Queensland growers, the Tasmanian Government acted generously, for among the orchardists of the island State there is a constant demand for the expert packers' knowledge and assistance. Mr. Rowlands' tour of duty was limited to one month in the Stanthorpe district, and the growers on the Granite Belt made the most of his visit. An immediate result of his instruction was a notable improvement in Stanthorpe consignments received at Roma Street, and a consequent improvement in prices.

Though a much longer period of instruction was desired, it was only possible to secure the services of the expert for the month of January. Full use, however, was made of the time allotted, and altogether thirty-seven public demonstrations were given. The localities covered were Eukey, Glen Aplin, Ballandean, Bald Mountain, Beverley, Broadwater, Applethorpe, The Summit, Thulimbah, Cotton Vale, Pozieres, Bapaume, Amiens, Dalveen, Stanthorpe, Wyerba, Dalcouth, and Kyoomba.

Attendances were particularly good, growers generally evincing the keenest interest in the demonstrations. Methods hitherto in vogue were, in many instances, somewhat slack and antiquated, and a result directly traceable to the instruction of the demonstrator is the checking of a tendency to disregard modern market requirements. On the other hand, orchardists who are most careful in picking and packing received an appreciable stimulus. It is interesting to note that Stanthorpe growers, who have in the past recognised the selling force of sound, well-packed products of good quality, are among the more prosperous. It is an axiom in Roma Street that any fruit of desirable variety, well grown, carefully handled, properly graded and packed, is more than half sold. Fruits and primary products generally are sold on the farm. Good fruit, honestly and carefully packed, will sell in any market. Slack packing and "topping" kills the grower's reputation. The markets are rarely glutted with first-grade fruits. Both dealers and consumers want the best.

A full description of Mr. Rowlands' methods, as adopted by the Tasmanian Government and adapted to Queensland conditions, together with appropriate illustrations, will be published in the Journal as soon as the letterpress comes to hand. It will be subsequently printed for distribution in pamphlet form.

One illustration shows trays of apples packed by the Tasmanian expert for exhibition at the recent Stanthorpe show.



2. The 3 2 Pack.

Plate 36.—1. Display of Fruit Packed by Mr. Rowlands, Exhibited at the Stanthorpe Show.

3 The 2 2 Pack.

STANTHORPE JUBILEE SHOW.

The actual initiation of fruitgrowing in the Stanthorpe District is shrouded in obscurity, but the pioneers who in the beginning obeyed the behest to establish a new industry builded better than they knew. To-day Stanthorpe, in its jubilee year, stands as a monument to the faith and character of its founders. Like some other Queensland towns, it enjoyed a transitory mining boom and suffered a temporary decline. But there were men in the district who knew that more wealth was to be won from the disintegrated granite beneath their feet than from stream and reef, and on that knowledge is built the prosperity of to-day. And with the complete emergence of man's oldest industry from the primitive to the scientific, it requires but little imagination to see Stanthorpe celebrating her centenary as a city centre, with well-constructed roads radiating to the limits of the Granite Belt, and providing every amenity that enriches rural life.

THE OPENING.

The Stanthorpe Jubilee Show was opened on 2nd February by His Excellency the Governor, Sir Matthew Nathan, who, in the course of his remarks, said:—

"This is the second year in succession that I have had the pleasure of opening your Show, and the occasion has afforded me an opportunity of seeing the advance made in the main industry of the district during the year. When I was here last

PLATE 37.—HIS EXCELLENCY SIR MATTHEW NATHAN OPENING THE STANTHORPE JUBILEE SHOW, 2ND FEBRUARY, 1922.

year it was at a period of glut in the fruit market. A Stanthorpe Co-operative Canning, Jam, and Preserving Company had started pulping about a month previously, satisfactory manufacture suffering somewhat from the desire to save as much as possible of the fruit that ripened in the short season from the middle of December to the end of the first week in March. At Amiens, the Pikedale Soldiers' Settlement Canning, Jam, and Preserving Company were about to begin work by pulping tomatoes with a view to subsequent manufacture of soups, as well as of sauces and other condiments. The Broadwater Co-operative Packing Company, who were at work in grading and packing peaches and other products, were finding it difficult

to get a market for the fruit. At the end of the season it was estimated that about half the fruit grown in the district had been wasted. There had evidently been want of organisation, and the decision was discussed locally that the various co-operative companies in the Granite Belt should be amalgamated under one head.

PLATE 38.—CANNING ON THE ORCHARD. HIS EXCELLENCY THE GOVERNOR INSPECTING MR. T. J. BALLENGER'S HOME CANNING PLANT AT "GARTHORNE," STANTHORPE.

As to how far this has been done, how far complete co-ordination has taken the place of competitive co-operation, I am not quite clear, but I gather that you are on the way to this, and that there is a Stanthorpe Fruit Growers' Council that is looking after the general questions affecting the fruit of this district and co-operating

PLATE 39.—SUN-DRYING FRUIT AT "GARTHORNE," STANTHORPE.

with the Southern Queensland Fruit Growers' Society in securing a wider distribution of the deciduous fruit grown in the district. The special fruit train that has been run from Wallangarra to Brisbane under the auspices of this society since the middle of December has, no doubt, improved the conditions under which fruit has been put on the Brisbane market, but probably this year is distinguished from last not so much by improvement in organisation as by the fact that the fruit crop is light in quantity and good in quality, and so more easily marketed. I think, however, from what I have read, that the growers in the Belt are realising that against the time of large crops of fruit of mixed quality they must solve the two great problems of standardisation and distribution. I notice that when speaking a short time ago at the meeting of the Southern Queensland Fruitgrowers' Society, the chairman stated that during a trip from Newcastle he had interviewed numerous fruit merchants in the various towns on the line and that they had all expressed a desire to do business direct with the farmer, but that they must be able to rely on a standard quality and pack. He added that he had seen fruit in the shops that should never have left the farm, and that in very few instances was the fruit graded or packed properly. 'Fruitgrowers had reached the end of things under present conditions; it was life and death to the industry.' I suppose stardardisation would mean that all deciduous fruit of the Granite Belt would go through a single packing-shed, and no doubt that subject is receiving the attention of the Stanthorpe Fruit Growers' Council. It would appear, from what I have been reading, that consideration is also being given to the problem of distribution. One element of that problem is the form in which the distribution of the produce should take place. New experiments are being carried out by the Commonwealth Government, though I cannot find that Queensland is taking part in them, with regard to shipment in cold storage overseas. The Queensland Government is giving facilities to the Southern Queensland Fruit Growers' Society for cold storage experiments, and it may be found advisable to have a cold store here to preserve some of the fruit—apples particularly—which ripen in the summer months, for distribution during the rest of the year.

PLATE 40.—QUEENSLAND CO-OPERATIVE FRUIT PRODUCTS COMPANY'S DEHYDRATOR, GLEN APLIN, STANTHORPE DISTRICT.

"Then, again, various dehydration plants are on trial, including the one at Glen Aplin, put up by the Queensland Co-operative Fruit Products Company, Limited. The gist, however, of the distribution problem can scarcely be better put than in a letter which appeared in the Press a short time ago from a fruitgrower of Manly. He said this:—'The real problem which fruit farmers and planters have to face is not one of treatment so much as one of highly organised marketing. In this respect the American, of California, can show points to the whole world. Whether the fruit products be fresh, canned, or dehydrated, they are selected with the utmost

care, graded with scientific exactness, packed excellently, and then, with agents of ripe judgment in every quarter of the globe, he is advised daily by wire and cable, and places his fruits in markets where there is a scarcity, thus avoiding a glut. The fruit farmer should not pin his faith to any one method of disposing of his produce, but adopt all.' The main question then for the growers in the Granite Belt is how to organise their marketing. This problem is worth the consideration which I am sure it will receive from the best brains in this district.''

PLATE 41.—A FRUIT EXHIBIT, STANTHORPE JUBILEE SHOW, 1922.

PLATE 42.—"HOUSEWIFE'S CUPBOARD," STANTHORPE JUBILEE SHOW, 1922.

THE FRUIT EXHIBITS.

The extensive collection of deciduous fruits was magnificent, and in the fruit section generally no fewer than 634 entries were received. The most striking feature of the display was the large number of cased exhibits showing a very high standard of selection and packing. A close and critical inspection made it very evident that the Granite Belt has nothing to fear from Southern competition. The Plate classes were also of outstanding quality. So good were the fruit exhibits generally that it became a matter for marvel that no local organisation has taken up the question of a constant supply of superior fruit to local hotels and railway stations. These provide means of advertisement of district products that cannot be disregarded.

RETURNED SOLDIERS' DISPLAY.

The Pikedale Returned Sailors and Soldiers' Co-operative Canning Company made a very attractive display of the products of their factory. The "Aussie Tomato Soup" label was prominent, and this is covering an excellent product.

Plate 43.—Display of Products of the Pikedale Returned Sailors and Soldiers' Co-operative Canning Co., Limited, Stanthorpe Jubilee Show, 1922.

The plant at Pikedale is small but efficient, and the process of treating tomatoes is simple and comparatively inexpensive. The tomatoes are first put through a pulping machine, which tears them into shreds, and the pulp is then run into 60-gallon steam-jacketed pans. An important feature of the processing is that absolutely no water is added to the pulp in the whole course of the operations. After boiling, the soup goes through another machine, which eliminates seeds and skins, leaving the pure product ready for canning.

In other displays of art and industry the returned men were well represented among the prize winners.

OTHER EXHIBITS.

The other exhibits at least equalled, if not surpassed, the standard attained at previous shows. An example of the right methods of grading and packing, as demonstrated by Mr. Rowlands, the Tasmanian expert, is described and illustrated elsewhere.

Sun-drying Fruit at Stanthorpe.

A SHORT REVIEW OF THE SUGAR INDUSTRY IN QUEENSLAND FROM 1914.

BY H. T. EASTERBY, General Superintendent, Sugar Experiment Stations.

Considering the vast importance of the Queensland sugar industry to Australia as a whole in developing and settling the North, it is difficult to understand the hostile attitude adopted by the Southern Press. The idea present in many Southern minds is that sugar-growing is a highly prosperous industry in which "large planters" make enormous profits, this being a kind of tradition that has descended from other countries and other times, even though many of the old planters had, at times, to meet low prices and other hardships. As a matter of fact, sugar-growing is carried on in Queensland by a large number of small farmers, many of whom have a hard struggle to get on. For many years past the cane farmer has had unceasingly to struggle against the high cost of production, increasing wages, insect pests, cyclones, and enhanced prices for all the goods he uses. It is willingly admitted that since the date of the last agreement between the Federal and State authorities, whereby the price of sugar was increased to £30 6s. 8d. per ton, the growers have been in a much better position, but it is almost always overlooked that from 1914 onwards through the war period, they were supplying sugar at a very low price compared with what was being obtained in other countries in the world. When an application was made in 1914 to the Interstate Commission for consideration, it was postponed on the grounds that the war was sufficient protection in itself, and they stated "that the sugar-growers would have the market of Australia entirely to themselves for the next two years." This was poor consolation to the sugar-grower at a time when sugar values in all parts of the world but Australia were increasing rapidly. As a matter of fact, the price in Australia in 1914 was £1 per ton less than in the year before. No benefit, therefore, came to the Australian sugar-producer, either from the effects of the war on the European crops of beet sugar or from the fact that he did have the Australian market all to himself. The action of the Southern Control of Prices Boards in 1914 in holding down the price of sugar led to many of the mills making an absolute loss on the season's operations, and prevented the cane farmer from obtaining that increase in payment for his cane to which he was justly entitled. It was a position directly antagonistic to the white labour policy of this country, and the national view of settling the northern littoral by means of the sugar industry for defence purposes. Fortunately, some small measure of relief was afforded by an agreement between the Queensland State Government and the Commonwealth, in 1915, whereby the price of sugar was fixed at £18 per ton. This price was nothing like what was hoped for, and the industry in 1915 was further handicapped by a terrible drought, which did immense damage in a number of sugar districts, and proved a further setback to growers.

The price during 1916 remained at £18, but this was a bad year for growers and millers, also being famous in sugar circles as the "Dickson Award" year, when some mills did not crush at all, and others did not commence till very late in the season. This meant great loss to growers and the standing-over of large quantities of cane to the 1917 season. In 1917 the price of raw sugar was raised to £21 per ton by agreement, which was still too low a price, taking into consideration the high prices ruling in other parts of the world. The Queensland sugar-producer, however, never pressed for the outside price of sugar. He did not wish to penalise the country; all he desired and hoped for was fair treatment. At the commencement of the 1917 season conditions appeared favourable for the harvesting of a record crop; and, while this was ultimately realised, yet the estimated output was finally reduced considerably. This was due to two causes:—

First.—The industrial strife in the Southern States, which held up regular supplies of bags and lime to the mills and prevented the sending of ships for the conveying of sugar to the refiners. The district of Mackay suffered most particularly, and the mills of that locality had to close completely on two occasions for several days for lack of sugar-bags, which had the effect of disorganising labour and causing a considerable number of men to leave the district. Due to the non-moving of the sugar, every wharf and store was congested. Many of the mills were obliged to add to their storage accommodation at a time when galvanised iron was almost unprocurable and both it and timber were at a very high price. Some of the Northern mills were obliged to store sugar within the mill itself, and the loss that ensued from all this double handling, payments for insurance and storage, and the deterioration of the accumulated stocks of sugar, was very high. On the Lower Burdekin, owing to lateness in starting, closing-up during the Northern railway dispute, and stoppage for want of sugar-bags, there was a large amount of cane unharvested.

Second.—The 1918 cyclones, which at Mackay caused the loss of over 6,000 tons of sugar, washed away from the sugar stores at mills and wharves in the floods and heavy rains.

These two factors materially reduced the 1917 crop, though it was still a record, but a good deal of the loss, mostly that in connection with the sugar spoilt by the floods, was borne by the Federal Government, which relieved the situation to a large extent.

In 1918 the price still remained at £21 per ton. That year two appalling cyclones struck the Queensland coast in the sugar districts. The severity of those cyclones not only caused immense damage at Mackay, Innisfail, and Babinda in particular, but seemed to affect the cane more or less in all the sugar districts. In addition to this, rain, floods, and frosts played their part in reducing the 1918 crop. These two cyclones inflicted enormous losses on sugar-growers, not alone in the terrific damage done to cane, but in the loss of life, destruction of houses, stables, and outbuildings, the whole work of years in many cases being swept away in the course of a few hours. The terrific rainfall which fell at Mackay during the three days after the cyclone amounted to 55½ inches, and did irreparable damage to household goods. The courage displayed by the people of Mackay, Innisfail, and Babinda was wonderful, but was characteristic of the inhabitants of North Queensland, whom no cataclysm of Nature seems able to terrify. How little is known in the Southern States of the trying experiences which the sugar-farmer has to undergo in order to make a living and fill the sugar-bowls of Australia! His fight with the tropical jungle in the fierce heat of a humid summer in the endeavour to clear a space for canegrowing and build a simple home is never considered by the city dweller, who has every comfort at his command.

After the abnormal rainfall in the early part of the year, the end of the year proved very dry.

During the year 1919, the sugar-consumers continued to get their sugar at very much lower rates than in any other country, but even then there was an agitation amongst the jam manufacturers for cheap sugar. As the "International Sugar Journal" reminded them, they were getting their sugar "dirt cheap." The agreement with the Commonwealth Government for the sale of raw sugar at £21 per ton terminated that year. The drought which commenced towards the end of 1918 continued into 1919, and adversely affected the crop, the yield of sugar being poor, and amounting to only 162,136 tons.

The year 1920 saw the dawn of a brighter era. The continual upward tendency of the world's market price for sugar became so great that at last it was generally recognised, as it should have been previously, that the sugar-growers were being treated unfairly. Steps were taken by a conference, which was held at the Department of Agriculture, to wait upon the Prime Minister of the Commonwealth and request that the price of raw sugar should be increased from £21 to £30 6s. 8d. per ton, and that an agreement to that effect should be made for a period of not less than three years. This was finally given effect to, and it immediately gave an impetus to the production for next year. Encouraged by the better outlook, farmers in almost every sugar district increased their areas, not only putting under cane, land that had been lying unproductive, but in many instances bringing new land under cultivation.

The more favourable rates for sugar did not come any too soon, as the price of all commodities which the sugar-grower uses had increased by leaps and bounds. Fertilizers, green manures, implements, and cost of living were all on a very high plane, and the latter has, of course, affected the wages of the labourer, so that the sugar-producer was often hard put to it to make ends meet. Compared with the prices that were obtained for sugar in outside countries, the price paid by Australia was very low.

The drought experienced in 1919 persisted into 1920, and the crop was again a poor one, though slightly better than in the previous year. The amount of sugar produced amounted to 167,401 tons. The new lands mentioned above as having been put under cane were, of course, not productive for that season. Hence the enhanced price received for 1920 did not benefit the industry to the extent hoped for, owing to short crops.

Coming now to the last twelve months, we may say that the sugar industry during that period has enjoyed a greater measure of prosperity than it has for many years past, and has made it apparent that if the industry is to be stabilised a fair price must be ensured.

While the price for sugar and cane is uncertain, growers will not risk putting in increased areas, nor can millers afford to bring their mills up to date and increase their efficiency. The effect of a guaranteed price for three years was immediately apparent. Farmers in nearly every district commenced putting new areas under

cane, using in many cases land that had been lying unproductive for years. The millers had their plants overhauled, and put in much-needed improvements, in many cases increasing the capacity of their mills. Improved railway communication also assisted matters; and new districts (such as Carmilla, near Mackay, and the Maria Creek Soldiers' Settlement, south of Innisfail) have been added to existing mills.

The present prosperity of the industry, however, did not come before it was needed. Due to the increased prices for all commodities and the high price of labour, farmers for some years prior to 1920 were unable to carry out the improvement of their land by better methods of cultivation and the use of fertilizers; and it may be added that a large number of our cane farmers were indebted to storekeepers, banks, and mills for financial aid. The present year, however, will see a great deal of this indebtedness wiped off, and a big advance in cultivation and the use of fertilizers has already taken place. It may be safely said that more fertilizers have been purchased this year than ever before in the history of the industry. It has been the aim of the Queensland growers to endeavour to keep Australia supplied with sugar, and as long as a fair price is offered, the industry will continue to do so.

The rich tropical belt of fine land comprised in the Banyan and Tully areas, between Cardwell and Innisfail, urgently needs developing by the erection of one or more large mills, and the sooner this can be accomplished the better. We require a great population in North Queensland along the coast to effectively settle and defend it, if need be; and the more population we have there, the more will the back country be settled and developed. It has been recently stated in connection with the last census that the increase in the population of the Herbert Electoral Division, which embraces the comparatively newly settled areas of Babinda and South Johnstone, was 19.4 per cent., or 14,929 persons—a greater increase numerically than in any other part of Queensland. This shows what can be done.

From the above review of the industry since 1914 it will be seen that the sugar-grower has had to struggle against a number of disadvantages, and that the Australian consumer profited at his expense for many years in obtaining cheap sugar, while all the rest of the world were paying enormous prices, up to 1s. 6d. per lb. It was always anticipated that owing to this fact and that the sugar-producer never asked for the world's parity during the war, they would be able to expect fair and just treatment from the Commonwealth of Australia. The present agreement only covers the coming crop, and the grower is at present again uncertain of what is going to happen. The highest need in the sugar industry is stability. Let us once secure that, and the expansion and success of sugar-production will become a certainty. New areas of land will continue to be put under cane; new mills will be erected, and the northern littoral of Queensland will become populated with a thriving community. If Australia is going to keep the sugar industry for the white race, it must be prepared to pay such a price for sugar as will enable this to be done. As the first Federal Royal Commission on the Sugar Industry said, "A white community which prefers to grow its own sugar in its own territory with white labour must face the responsibility of making good the increased cost of production under the higher standard of living and reward. Either the consumer or the taxpayer must pay." Australia is the only place in the world where cane sugar is being produced by white labour. We are in competition with countries which produce sugar by black labour and under black-labour conditions. Without protection, it will be quite impossible for the Australian industry to survive.

Finally, I would bring this paper to an end by quoting the words of the first Royal Commission:—

> "The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence. No nation can afford to regard lightly the development of its industries, the progress of its wealth, or the economic efficiency of its productive machinery. But, important as these things undoubtedly are, they rank, as regards the sugar industry, on an inferior plane. The Commonwealth to-day is brought face to face with one of the gravest problems that has ever taxed the ingenuity of statesmanship—that of the settlement of tropical and semi-tropical areas by a white population living under standard conditions of life. And intimately associated with this problem is the question of national defence.
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> "If the ideal of a White Australia is to become an enduring actuality, some means must be discovered of establishing industries within the tropical regions. So long as these regions are unoccupied, they are an invitation to invasion, as well as a source of strategic weakness. Granted so much, it follows that the supreme justification for the protection of the sugar industry is the part that the industry has contributed, and will, as we hope, continue

to contribute to the problems of the settlement and defence of the northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the sugar industry. Relatively to it, all other issues are of minor importance.''

This statement as to defence has been justified by the fact that one in eight of the entire population of Mackay enlisted to defend our country; over 3,000 enlisted in Bundaberg—a similar proportion; and about the same proportion in Cairns. Had the rest of Australia enlisted in the same ratio, we should have had over half a million men.

SUGAR: FIELD REPORTS.

The Southern Field Assistant (Mr. J. C. Murray) reports under date, 7th February, 1922, as follows:—

''*Bundaberg.*—Remarkable growth is in evidence on all the Bundaberg cane farms, more especially on the highlands south of The Hummock. On the Woongarra area the farms are looking their best, and growers are expecting a heavy crop for next year. In anticipation of this, it is likely that the mills will start operations early in the season. Assuming that this will be so, much of the cane will have to be harvested at an unripe stage, as very few of the varieties attain their maximum c.c.s. values before the 20th of September. The question of introducing the early maturing cane (H.Q.285) should therefore be considered.

''Mr. R. Nielson, on the Sandhills road, has a fine crop of this variety to harvest next year, and growers interested should look at this cane growing under field conditions.

''Now that the soil is in good condition, with plenty of moisture, a good tilth should be kept, so that the capilliary moisture may be conserved as the earth dries.

''At Barolin the prospects are sound. More fertilising with concentrated fertilisers is being undertaken than hitherto, and although last winter the frost affected the cane on the low-lying portions, the beneficial results of these operations are noticeable. The best results have been obtained on red forest loams by fertiliser containing a predominance of potash, and by nitrate of soda as a top-dressing for ratoons, to the extent of 1½ cwt. to the acre.

''Good results have periodically been obtained by the Pemberton Estate management through the use of lime and the ploughing-in of maize as a green manure.

''Good results are being obtained from fertilising D.1135 with 3 cwt. per acre of bonedust. What may suit one farmer, however, may not suit another, and the best guide to manuring is local experiment and soil analysis.

''Early spring planting should be adopted as much as possible with quick-growing canes, so that, if frosts occur, the well-grown cane may have greater powers of resistance than young autumn-planted cane.

''At Millbank and on the river generally there is very little poor cane at present. Both the plant and ratoon crops have grown several feet in the last couple of months, and varieties such as H.Q.813, 112, 970, D.1135, M.1900, and H.Q.285, especially the latter, are all giving the growers satisfaction.

''To avoid confusion, growers obtaining canes from the Experiment Station should be careful to place the number of the variety at the end of the row after planting, for future identification. Careful methods of cultivation should be observed from now on through the year, as dry weather may come, and it is essential to keep the land in good condition, with a fine tilth.

''On the Gooburrum side the farmers are making headway. There is still a lot of land in this area suitable for cane. In this respect a number of farmers are seriously thinking of getting more land ready for the plough, and there are about 1,000 acres of swamp at the head of Tantitha Creek which would be excellent for agricultural purposes if cleared and drained.

''Cane pests and parasites are at present causing a minimum of trouble, although beetles are flying plentifully at present. Regarding the latter, one farmer mentioned the efficacy of the bandicoot in destroying grubs. He said they damaged the cane very little, but at one time completely wiped out a bad grub infestation on his farm.''

The Northern Field Assistant (Mr. E. H. Osborn) reports under date, 7th February, 1922, as follows:—

"*South Johnstone.*—The early part of January was spent at the Experiment Station here. The great growth in nearly all the cane was most marked. At the time the weather was ideal for canegrowing, as the heavy tropical showers were followed up by intensely hot bursts of sunshine, and any well-cultivated cane was bound to respond. Throughout South Johnstone and Mourilyan some fine cane was noticed, and all growers are busily engaged ratooning, scarifying, and weeding. At South Johnstone some of the Mourilyan farms were visited, and a little time was also spent at the mill. The mill finished crushing just prior to Christmas, after putting through the very good tonnage of 85,744 tons of cane off 4,615 acres, giving a return of 18.5 tons per acre. Of this tonnage 77 per cent. was green and the other 23 per cent. burnt; the density averaged in the vicinity of 13 c.c.s.

"No labour troubles of any kind caused delay, and the cutting rates were said to be very reasonable. The mill officials were very hopeful of a good season for 1922, as the acreage to be cut amounts to 5,010 acres, or practically 400 acres more than last year's, and the cane has been favoured with a good start.

"Probably 90 per cent. of the Mourilyan cane is Badila, the balance being H.Q. 426 and the Gorus 24, 24A, and 24B.

"A good deal of interest is being taken locally in the work of the Experiment Station, and a big demand for new varieties is sure to be made at the next distribution of cane plants. A great deal of interest is also being manifested in the new seedlings at present in the very early nursery stage. Of the eighty-two growers supplying the mill, about 25 per cent. are British; the remainder are represented by a very industrious type of Italians and Spaniards.

"Manuring is being carried on in a far larger proportion than in past years. Liming is such an expensive item in this district that its use so far has been very light, but the growers recognise the advantage of its use.

"The South Johnstone mill finished its season with a total of 120,686 tons of cane from an acreage of 6,697 acres, equalling a yield of 18 tons per acre. Practically 90 per cent of the crop was Badila, the remainder being H.Q. 426 or the Gorus. Of the total tonnage, 54 per cent. was cut green and 46 per cent. burnt.

The prospects for the coming season are bright. The acreage to be cut amounts to 7,204 acres from the South Johnstone mill area (of which 209 are standover) and 450 acres from the Maria Creek Soldiers' Settlement (195 acres of which are also standover), or a total of 7,654 acres in all.

"As most of the cane looks vigorous at the present time, a good crop should be the outcome for 1922.

"The mill management have initiated an active rat-poisoning campaign; and to combat the borers they are arranging with Mr. Jarvis, of the entomological station at Meringa, to free numbers of Tachinid flies in suitable cane areas to cope with the pest. Quite a large number of paddocks were noticed in the Goondi and Mourilyan areas under green manure. In the former area a large number of various makes of tractors were working, and the general satisfaction expressed by the owners at being able to carry on constant work, despite the very hot weather conditions, was marked. Goondi mill finished crushing earlier than either of its neighbours, and 105,000 tons of cane represented its output.

"*Soldiers' Settlement* (*Maria Creek*).—Since my last visit in September the North Coast line has been completed from Innisfail to this centre, and in future the railway station at the settlement will be known by the name of ' El-Arish ' (Palestine Campaign). The linking up of this line has made a vast difference in this place, and travelling down in comparative comfort on the 3 ft. 6 in. line makes one recall the miles of slush called roads that formerly had to be negotiated in the wet season from the end of the 2-ft. line at Silkwood to the present terminus. This only refers to the early part of last year, and as 198 in. of rain fell at the settlement during 1921 it will be easily seen that the roads were very seldom dry. In going around the area, quite a number of new houses were noticed, and I learn that fifty-five settlers are now in occupation of their blocks. The area under cane is now 635 acres, the greater proportion of which should be harvested in 1922. Nothing but Badila has been planted in the area, and generally speaking it looks healthy. Mr. Martin, the supervisor, tells me that the cane has grown comparatively more in the last month or so than in any other period of its growth. Adjacent to the hillside, on the reddish soils, some very fair cane was seen. About the best of this was upon Mr. Willman's block. Mr. Willman has had previous experience growing cane with some of the leading farmers in the Goondi district and has kept his field in an excellent state of cultivation, with the result that a very heavy crop should be harvested. As all the areas are small there is no excuse for dirty cultivation.

"Regarding harvesting operations for the coming season, the Public Estate Improvement Board is making a number of main roads, and the South Johnstone mill is supplying the settlement with 3 miles of rails, to be used for a horse tram, and also a couple of miles of portable rails for the fields, thus connecting the farms with the derricks on the North Coast line.

"*Aloomba.*—A short visit was paid to Aloomba and Gordonvale. At the former place the cane looks healthy, for cultivation and liming are now being carried out. Green manuring the fertilizing have received much attention.

"On Mr. F. Martin's farm the writer saw one of the best crops of cowpea he has seen for some time. The cane on this farm compares very favourably with any seen in the vicinity, and it says much for the way in which the cane has been carefully cultivated.

"*Gordonvale.*—In this locality the cane also was looking very vigorous. The Mill harvested approximately some 4,100 acres, for a return of 85,500 tons of cane, giving an average per acre of 20.8 tons; 4,500 tons were also crushed for Babinda, making the total of 90,000 tons. Of this amount, over 80 per cent. of the total was burnt. Considering the average tonnage per acre, and the thorough cultivation that is generally carried out in this area, this percentage of burnt cane seems very high. The average density was 12.86 c.c.s. As a large amount of rain fell during the season these figures are very fair.

"Since the new year a surprising amount of dismantling work has been carried out in the mill. The alterations involved are vast, but if the amount of energy that is now being put into the work by the various responsible officers is any criterion of its future success, then the 1922 season will be all that the many wellwishers of the Mulgrave Mill hope for. When completed, the mill will be in a position to handle 5,000 tons of cane per week."

PORTABLE TREE-FELLING AND SAWING PLANT.

The felling of trees is part of the early work of the pioneer in nearly all countries, and many appliances have been devised for lightening the labour involved. One of the latest, which has the advantage of lightness and efficiency, has been put on the market by a British firm. It is driven by an engine which develops 2½ h.p., and it is capable of felling trees with the engine placed in almost any position relative to the tree. The saw is driven by means of a coupling-rod with universal joints. A clutch is provided to obviate the stopping and restarting of the engine every time the cut is altered. The engine is also provided with a pulley so that it can be used for driving stationary machinery. When the machine is employed for sawing logs the handles of the machine rest on the log, a movable chain with pointed hooks being provided to hold the log secure. It is a very simple matter to alter the machine from tree-felling to log-sawing, and the machine can be readily moved about and operated by one man.

BRITISH CONCRETE MACHINE.

At a recent exhibition held in London, a remarkable display of concrete machinery of various kinds was made by a large number of British firms. One of these machines was a concrete block maker capable of turning out 1,000 blocks in an eight-hours working day, or 130 partition slabs per hour. When used on a house-building contract, two of these machines turned out, on the average, 2,400 blocks per day of eight hours for a period of two months. On one day the two machines actually produced 3,320 blocks in eight hours. Another machine, designed for making concrete slabs for paving purposes, averaged between forty and fifty slabs in the hour, and has produced as many as sixty per hour under service conditions. A third machine is capable of producing everything in the way of material that a builder or anyone undertaking repairs to property may require. Blocks of various sizes, bricks, window-sills, steps, hearths, mantelpieces, wall-coursings, and so on, can all be produced by this machine.

WHAT PART CAN CHALCID WASPS PLAY IN CONTROLLING AUSTRALIAN SHEEP-MAGGOT FLIES?

BY PROF. T. HARVEY JOHNSTON and O. W. TIEGS, University, Brisbane.

In the "Queensland Agricultural Journal," June, 1921, there appeared an article by the senior author, entitled "The Sheep-Maggot Fly Problem in Queensland," in which certain investigations undertaken at the University in connection with the Walter and Eliza Hall Fellowship were referred to. In August, 1921, the writers published a paper in the "Proceedings of the Royal Society of Queensland" describing the results of their experiments as to the economic importance of chalcid wasps with regard to the control of the sheep-fly pest. As contradictory statements have been made from time to time regarding these insects, it was thought advisable to prepare the present article to give wider publicity to the views therein expressed, and to take the opportunity to add some further observations.

The extent to which a parasitic insect, such as certain wasps, can control its host (*i.e.*, the insect or other organism in which it lives) depends on a number of different factors. (1) One of the most important of these is the readiness with which the parasite can gain access to the insect that it is able to destroy. If only a small percentage of the number of individuals of the species upon which or within which the parasite breeds is available for attack, then the economic importance of the latter is small; in fact, its usefulness depends directly upon the ratio of the number of host insects (sheep-maggot flies in this case) available for attack to those which are inaccessible. In other words, if only a small percentage be liable to infestation, then the controlling influence of the parasite will be comparatively small. (2) A second very important factor is the relative rates of breeding of the parasite and its host, not merely in regard to numbers of offspring produced, but also as regards the length of the life-history in each case. (3) Other factors which need to be considered are the presence of food for the adult stages of the parasite; the suitability of the environment as regards temperature and humidity; the presence of hyper-parasites, &c. The effects of the various factors just mentioned could not readily be estimated in the laboratory, but the first (1) and second (2) were investigated. The results obtained proved unfavourable so far as most of the chalcids hitherto described as sheep-blowfly controls in Australia were concerned, and indicated that unless their behaviour under field conditions in sheep country was quite different from that which was observed in Brisbane, then little importance could be attributed to them as controlling agents. As indicated in a previous article in this journal, there are eight such wasps known in Eastern Australia as parasites of blowflies, while a ninth, which infests house flies, is also known. All nine are recorded from Queensland.

1. *DIRHINUS SARCOPHAGÆ* FROGGATT.

According to its discoverer, Mr. W. W. Froggatt, Government Entomologist, Sydney, this "digger wasp" is capable of digging beneath the surface of the soil in search of pupæ in order to lay its eggs in them. Our observations in the laboratory have not confirmed this, though it was found to readily oviposit in exposed pupæ of many different kinds of blowflies. The species, whose biology has been studied by us, is not very common in Brisbane and probably elsewhere also. Its importance in controlling blowflies appears to be negligible.

2. *PACHYCREPOIDEUS DUBIUS* ASHMEAD.

This small wasp, a parasite of house flies, is known to occur in North Queensland, but its relation to blowflies has not been ascertained. It appears to be so uncommon as to be of no importance economically in this State.

3. *HEMILEXOMYIA ABRUPTA* DODD.

This is a fairly large Diapriid wasp, about a quarter of an inch long, first obtained by Mr. Froggatt from the small black blowfly (*Ophyra nigra*), and later from *Calliphora villosa* (= *Neopollenia stygia*) in New South Wales. We have taken it from a carcass in the vicinity of Chinchilla, West Queensland (September, 1921). Mr. Froggatt, in his latest article ("Agric. Gaz., N.S.W.," Oct., 1921) describes it as parasitising the maggot stage, crawling amongst putrid matter in search of the fly larvæ. In this respect it acts like *Australencyrtus*, to be referred to later. It would be worth while to endeavour to breed up this wasp and to study its biology. Its habits, as far as we know them, should render it a valuable insect, if sufficiently abundant.

4. *CHALCIS DIPTEROPHAGA* GIRAULT AND DODD.

We found this species attracted to blowfly-maggots on one occasion in Brisbane. It was previously bred from fly pupæ in North Queensland. Its rarity prevents it from being an efficient blowfly exterminator.

5. *CHALCIS CALLIPHORÆ* FROGGATT.

This species resembles No. 4 in general characters, but possesses reddish-yellow antennæ and a shining red-brown abdomen. It was described as attacking living maggots, depositing a single egg in each. Like the preceding wasp, its rarity prevents it from becoming an important enemy of blowflies. It is known from New South Wales and North Queensland (W. W. Froggatt). The plate depicting this species, and contained in the senior author's previous article in this journal, was inadvertently inserted there by the Editor.

6. *PARASPILOMICRUS FROGGATTI* JOHNSTON AND TIEGS.

This proctotrypid wasp was first obtained by us in 1920 from naturally infected pupæ of the common green blowfly (*Lucilia sericata*). We have since met with it on several occasions in Brisbane, but it is too uncommon to be of any real economic importance. It is a parasite of blowfly pupæ, ignoring the maggots.

7. *SPALANGIA MUSCIDARUM* RICHARDSON.

Though originally described from the United States as a parasite of house and stable flies, it was found by us to occur in Queensland, naturally infesting the pupæ of various fleshflies and blowflies, in addition to those mentioned. In the Upper Burnett district more than 40 per cent. of pupæ of species of *Musca*, collected in the field, were found to have been parasitised and destroyed by this ant-like wasp. It is not common in Brisbane.

Some years ago Mr. F. H. Taylor sent us *Lucilia* pupæ from Roma, from which *Spalangia* was bred out in Brisbane. We were not able to distinguish it from *S. muscidarum*. A number of them were submitted recently to Mr. A. Girault, the well-known authority on chalcids and the describer of all the known Australian species of *Spalangia*, but he stated that the determination of species belonging to the group was almost impossible at present on account of the confusion which had crept into the literature. Mr. Froggatt (''Agric. Gazette, N.S.W.,'' November, 1921) referred to Mr. Taylor's specimens as *S. grotiusi* Girault. For the present we prefer to retain them under Richardson's name.

8. *NASONIA BREVICORNIS* GIRAULT AND SANDERS.*

This, the best-known chalcid parasite of the pupæ of muscid flies, has been utilised widely in New South Wales and Queensland in the attempt to control sheep-blowflies. It does not attack the maggot stages.

In order to determine the economic value of this insect, a number of experiments were carried out. It was first deemed necessary to estimate the extent to which blowfly pupæ (*Pycnosoma, Lucilia, Sarcophaga, Ophyra*) were available for attack. Some fully-grown larvæ were placed on soft soil, ¼ to ½ in. in depth, in a shallow basin; they soon pupated below the soil, and the basin with its contained pupæ was put in a cage in which were numerous female *Nasonia* wasps, but the latter were found to be unable to reach the pupæ, which were apparently safe from attack.

It is then very important to know where sheep-maggot flies pupate. The simple experiments to be mentioned now were carried out in Brisbane partly in the open and partly in the laboratory, both giving quite similar results. Still, as we have not had the opportunity to repeat them under natural sheep-land conditions, they cannot be accepted as conclusive. It should be noted, however, that those who have advocated the use of this chalcid have not paid any attention to this side of the question, upon which so much really depends.

Mr. Froggatt (''Agr. Gaz., N.S.W.,'' Oct., 1921, p. 726) mentions that the larvæ which are being bred up in his laboratory, in order to undergo artificial infestation later, leave the decomposing liver which serves as food, bury themselves into the sand used in the breeding boxes, and there pupate. In the succeeding number of the ''Gazette'' (Nov., 1921, p. 809) he states that the fully-fed larvæ, on falling from the live wool to the ground, usually pupate above the soil, while those in a dead beast crawl to the edge of the disintegrated carcass to pupate and are thus nearly all accessible to the ovipositor of the pupa-parasitising wasp.

The following experiment with *Lucilia sericata* (the green blowfly and one of the commonest sheep-maggot flies) was carried out by us in Brisbane:—A number of females were permitted to lay eggs on meat placed above some soft soil. Only

* Mr. A. Girault has just informed us by letter that the correct name of this wasp is *Nasonia abnormis* (Boheman), originally described from Europe.

the fibrous debris ultimately remained, and under this the larvæ could easily have pupated. Layers of underlying soil were carefully removed and the pupæ contained in each counted, the following results being obtained:—

	Pupæ.
On surface or partly exposed	105
To depth of ¾ inch	663
From ¾ to 2¾ inches	1,403
From 2¾ to 3½ inches	172
From 3½ to 5 inches	51
From 5 to 6 inches	7
Below 6 inches	0
Total	2,401

Out of a total of 2,401 pupæ, only 105, *i.e.*, 4.37 per cent., pupated in positions within reach of *Nasonia*. It was found that in wet weather all the pupæ were located beneath the surface. We have repeated the experiments with the large green blowfly (*Pyenosoma* (or *Chrysomyia*) *rufifacies*) on several occasions, with practically the same results, its hairy pupæ generally being situated below the surface. When a pastoralist turns over a carcass which has recently been destroyed by maggots, he may find thousands of pupæ beneath it, and of these perhaps at least half (or even up to 80 per cent.) may be parasitised and destroyed by the chalcid; yet the fly nuisance increases. The explanation—supposing that larvæ behave in the field as they do under laboratory conditions—is that for every pupa seen on the surface, twenty or more are to be found beneath the surface and out of reach of the wasp. These results are not encouraging.

Let us examine the second factor in effective parasitism, viz., the relative rates of breeding in the case of *Nasonia* and the sheep-maggot fly (*P. rufifacies*). Our observations in Brisbane show that the minimum period elapsing between the deposition of the eggs of the chalcid and the time when the resulting wasps which hatch out are ready to lay eggs, is about ten days; while in the case of the blowfly it is longer —a fact in favour of the chalcid. But let us examine further. The blowfly lays, as far as is known, on an average, about 250 eggs, whereas the chalcid deposits about 113. Now, unfortunately, the latter do not cause the destruction of 113 blowflies, since the wasp deposits on an average about six or seven in each pupa, thus parasitising from seventeen to twenty blowfly pupæ. At times the chalcid may deposit a much greater quantity in each pupa, so that the number of flies destroyed is correspondingly less.

A third fact tells against the importance attributed to *Nasonia*. During the height of summer it is found that the pupal period for the hairy maggot-fly is from three to four days. Even though the wasp may have deposited its eggs in a fly pupa, yet no harm can result until after the hatching of those eggs, an event which we found takes about forty hours to occur. Thus, out of the three or four days in which the wasp might destroy the pupa, nearly two days are necessarily lost during the hatching of the eggs. Hence if the pupæ are not attacked within about two days (perhaps less in summer) after pupation, the wasp can no longer injure them, no matter how many eggs may be laid in them after that period. Moreover, such eggs must perish when the fly emerges.

Most of the empty puparia, from which flies have escaped, would be removed by wind. It is almost certain that observers collecting fly pupæ in the field, in order to estimate the percentage of parasitised material, would pick up only the unhatched pupæ. Since the young stages (larva and pupa) of the chalcid occupy about eleven days, infected fly pupæ are, then, accumulating for eleven days underneath carcasses in the field. Blowfly pupæ, on the other hand, take only three or four days to develop into flies, so that uninfected pupæ are accumulating for that period only, under similar circumstances. Hence, when the collector brings in a batch gathered in the field on any particular day, he is really including both parasitised and non-parasitised material, but these would not be in the ratio in which they actually have been produced, but in the ratio of their relative rates of accumulation. In other words, there would be perhaps three or four times as many infected pupæ as should be taken into consideration when estimating a percentage infection. Of course, a series of collections at intervals of about three days would give a much more accurate result, as it would account for the uninfected flies which otherwise would have emerged and not become included in the tally. From the foregoing it will be seen that as a result of casual collecting there is great probability of a totally incorrect result being obtained.

We may, then, summarise the results regarding *Nasonia*:—

(*a*) The majority of sheep-maggot flies apparently pupate in places where they are not exposed to infection by *Nasonia* or other pupa-infesting wasps; hence only the smaller number which have pupated on the surface can become parasitised.

(*b*) Flies breed much faster than do the wasps, a single female *Nasonia* being able, on an average, to destroy from seventeen to twenty fly pupæ, whereas a single female blowfly can produce about 250 flies.

(*c*) During the hot season (*e.g.*, February) blowfly pupæ, on account of their accelerated development, enjoy a considerable degree of immunity from effective attack by such wasps as parasitise the pupal stage.

As a result of our observations, we are forced to regard *Nasonia* as a greatly overestimated factor in the control of blowflies.

9. *AUSTRALENCYRTUS GIRAULTI* JOHNSTON AND TIEGS.

This "brown-legged wasp" was discovered last year by us in Brisbane, and by Mr. Froggatt in New South Wales. It appears in the former locality in abundance during October and November (when *Nasonia* is not so common), but diminishes as the summer advances (when *Nasonia* becomes more plentiful).

It is slightly larger and more active than *Nasonia*, and is readily recognised by its yellowish-brown undersurface and its brown legs. The female confines its attention to the maggots, searching for them even amongst putrid material, and parasitising them even when fully covered by a thin layer of the decaying matter in which the larvæ are feeding. Pupæ are ignored by it. Apparently from five to seven eggs are deposited in a maggot at each act of oviposition (not merely one egg in each pupa as stated recently by Mr. Froggatt).

The wasp can be readily bred in captivity. During midsummer a period of twenty days elapses between oviposition and the emergence of the resulting adult wasp. This period lengthens to about twenty-five days in spring (October), twenty-eight to thirty in autumn (May); and about six weeks during winter (June and July). The female is able to parasitise maggots on the day of its emergence from the destroyed fly puparium.

The long developmental period appears to be a disadvantage from the point of view of efficiency in fly-control, but the fact that this wasp can attack the maggot stage is very much in its favour, because of the length of time occupied by the fly in this stage, and because of the need of the larva to maintain communication with the air, this giving the wasp an opportunity to attack it. An illustration of its efficiency was noticed last October, when, in order to obtain a supply of fly pupæ, some meat was exposed in a glass jar, soil being placed in the bottom of the jar to receive the pupating insects. The latter pupated under the soil, from which they were subsequently collected. On examination it was found that nearly all contained about five larvæ or pupæ of this wasp, this being apparently about the number deposited as eggs at one oviposition. This observation is open to the same objection as was raised against the recorded percentages of infection of pupæ by *Nasonia*, so that the actual percentage of infestation observed may have been too high. A more serious objection which it shares with *Nasonia* is the periodic nature of its appearances, but by means of laboratory supplies this could be remedied. It seems to us to be well worthy of trial under field conditions in Western Queensland.

This wasp was recently described in the "Agricultural Gazette, N.S.W.," (October, 1921, pages 730-1), by Mr. A. P. Dodd under the name *Stenosterys fulventralis*, which is a synonym of our name *Australencyrtus girault*i. The inclusion of the species in the genus *Stenosterys* appears to have been due to the difficulty in observing the structure of the mandibles. The presence of three "teeth," however, removes it from the Ectromini, to which *Stenosterys* belongs, and places it among the Mirini of Ashmead, or the Encyrtini, as conceived by Girault.

10. *ALYSIA MANDUCATOR* PANZER.

Alysia is a large braconid wasp, stated to be very active in controlling house flies in England, and, according to Professor Lefroy, would be of great value in combating the Australian sheep-flies. This insect has the special advantage that it attacks the maggot stage and lays only one egg in each. As it is capable of depositing a very large number of eggs, its effective destructive power must be considerable.

According to Mr. Froggatt, it is "an indiscriminate parasite on the pupæ of all kinds of flies, and among others is very partial to those of the European syrphid flies." As the latter are very useful agents in controlling aphids which attack cultivated plants, careful observations regarding the relation of *Alysia* to such useful flies would need to be made before the utilisation of even such an ally as *Alysia* should be attempted.

CERTIFICATES OF SOUNDNESS.

FEBRUARY REGISTRATIONS.

Name of Stallion.	Breed.	Period for which Certificate was issued.	Owner's Name.	Owner's Address.
Hindoo Lad ..	Blood	Life ..	W. Baguley ..	Pratten Street, Warwick
Victor Wilkes ..	Trotter	Life ..	C. W. Free ..	Headington Hill, Clifton
School Boy ..	Pony ..	12 months	W. J. McKone	Allan's Siding, Goondiwindi Line

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1922 AND 1921, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1922.	Jan., 1921.
North Coast.	In.		In.	In.
Atherton	12·44	20	8·27	7·37
Cairns	16·98	39	6·05	15·65
Cardwell	17·30	49	3·92	12·44
Cooktown	14·74	45	8·08	33·67
Herberton	9·88	34	6·86	5·22
Ingham	16·78	29	3·15	15·39
Innisfail	21·02	40	6·03	18·19
Mossman	18·81	13	9·25	13·72
Townsville	11·91	50	5·23	5·75
Central Coast.				
Ayr	12·37	34	6·55	8·09
Bowen	10·55	50	5·12	6·99
Charters Towers ...	5·78	39	2·26	8·81
Mackay	15·32	50	4·78	15·91
Proserpine	18·40	18	3·12	14·96
St. Lawrence ...	10·03	50	2·05	18·30
South Coast.				
Biggenden	5·46	22	4·04	5·37
Bundaberg	9·26	38	7·54	7·41
Brisbane	6·42	71	3·62	4·04
Childers	8·03	26	6·13	5·52
Crohamhurst ...	12·56	30	7·26	12·41
Esk	5·66	34	2·88	3·96
Gayndah	4·83	50	2·13	4·94
Gympie	6·81	51	2·88	6·41
Glasshouse M'tains	9·17	13	4·67	8·38
Kilkivan	5·80	42	1·14	4·15
Maryborough ...	7·42	50	3·14	7·34

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1922	Jan., 1921.
South Coast—continued:	In.		In.	In.
Nambour	9·47	25	4·39	9·18
Nanango	4·58	39	3·22	3·32
Rockhampton ...	9·25	34	4·36	4·67
Woodford	7·43	34	3·49	8·81
Darling Downs.				
Dalby	3·34	51	3·09	2·31
Emu Vale	3·22	25	1·24	0·83
Jimbour	3·80	33	1·48	3·21
Miles	3·92	36	2·77	2·42
Stanthorpe ...	3·60	48	1·20	1·07
Toowoomba ...	4·99	49	2·28	2·94
Warwick	3·61	34	1·29	1·25
Maranoa.				
Roma	3·44	47	3·59	1·41
State Farms, &c.				
Bungeworgorai ...	2·32	7	2·41	1·35
Gatton College ...	4·37	22	2·39	2·34
Gindie	4·04	22	3·91	3·12
Hermitage ...	2·97	15	1·40	1·83
Kairi	8·80	7	Nil	5·19
Sugar Experiment Station, Mackay	17·14	24	3·71	12·70
Warren	7·19	7	2·44	4·80

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

Editorial Notes.

1922 Cotton Season.

Cottongrowers are reminded of the importance of waiting until their product is quite mature before commencing picking. The boll should be fully opened. Ripe cotton means higher profits and time saved in harvesting. The Australian Cotton Growing Association has arranged to receive and gin this season's crop. Machinery is now in course of assembly and installation and structural work is well forward. The Association will be prepared to receive unginned cotton at the Rockhampton Ginnery on 18th March, and at the Hamilton (Brisbane) Ginnery on 1st April.

* * * * * * *

The Commercial Side of Farming.

Everyone interested in the welfare of rural industry, and therefore who thinks nationally, knows that the unsatisfactory conditions with which agriculture is burdened to-day are due in a very large measure to lack of effective co-operation. Agriculture is not merely farming; it is a business, an industry, and on its commercial side it has two important aspects. From a national point of view it is desirable that food should be produced at the most reasonable price to the consumer compatible with a fair profit to the producer. From the farmer's point of view it is essential that he should be able to market successfully that which he produces not only in lean seasons when supply is less than the demand, but also in seasons of plenty when conditions are reversed. He should always be stimulating demand, and the best stimulus is reasonable prices. To sell at reasonable rates it is important that produce should reach the consumer loaded only with the lowest possible intermediate charges. The cost of production and distribution must be reduced to a minimum. In turn the cost of purchasing machinery, fertilisers, and other equipment and commodities necessary for the carrying on of the farmer's business should also be reduced to a minimum. And to ensure this reduction both ways, agricultural co-operation is the only effective means. The advantages that lie in the bargaining power of combination are obvious. By combination in both buying and selling the farmer would receive: (1) the benefit of wholesale rates, and (2) reduction of intermediate costs of distribution. The days of single purpose co-operation are passing. What is seriously engaging the thought of those concerned most closely with rural economics is not only the co-operation of individual farmers but also the effective co-operation of co-operative concerns. The whole strength of the co-operative movement depends upon the reality, the extent, and continuity of combined action. In no other way can farmers secure the best terms on both the buying and selling sides of their business. By no other road can they reach a position of commercial strength which will enable them to meet the biggest buyers of their produce on level ground. An unalterable condition of the acquisition and retention of that power is their absolute loyalty to their own business ventures. The weakness of co-operative concerns to-day is that farmers are often not loyal to the enterprises they themselves have created. Not that they, less than any other section of the community, are wanting in the moral quality of loyalty, but, for some reason or other, they apparently cannot see how much it is to their advantage to maintain effective and continuous combination for the sake of the commercial power it would confer upon them. If farmers get together, stick together, and act together in all things for the betterment of their industry, it will not be long before they will be in a position to effectively control their business on both sides from the bucket to the selling floor, from the paddock to the pantry, and reap rewards for their labour that would be reasonable and just.

General Notes.

SHEEP AS A SIDE LINE.

Writing in the Mackay "Daily Mercury" (18th February, 1922), a correspondent says:—"For many years our State Government sheep expert, Mr. W. G. Brown, has reasoned with and urged on settlers on the coast to take on a small flock of sheep as a side line. The great majority of those who took Mr. Brown's advice and followed his teaching have good reason to congratulate themselves and thank him. The small percentage of failures has been mostly due to the fault of the settlers. Right at our door we have proof positive that sheep will do well on the coast, and proof not alone that they can be fed but that they can be bred. The L Islands have carried sheep for some years, and, judging by some I have seen from there, the

Messrs. Bussetin are going intelligently to work to develop a very fine class of sheep. But, long before sheep were put on L Islands, Captain Adderton had established a flock on Lindeman Island, the most northern of the group of which the L Islands form the southern part, and descendants of that flock are still on the island. Thus, Lindeman Island has been constantly under sheep for a period of about twenty-five years. Actually the grazing quality of the island has vastly improved; and the sheep, though largely of the Merino strain, have not deteriorated. The present owner, who bought out Captain Adderton, has, however, introduced Border Leicester rams, and the result should be a great improvement in frame and weight of fleece. Lindeman Island is certainly ideal for coastal sheep-raising. It has a perfect harbour, and is within easy reach of Mackay, Proserpine, or Bowen. It has abundant and permanent water, and a rich black basaltic soil. It is splendidly grassed, and is capable of carrying safely up to 5,000 sheep. I was present during shearing, and had practical demonstrations of the freedom from seed in the wool. But there are opportunities right here, on the mainland, for intelligent farmers to keep a small flock of sheep as a side line, and these farmers need not be afraid to breed lambs for market or home consumption. The lantana farmers, of whom, unfortunately, we have a large proportion, would be well advised to leave sheep alone."

KUDZU—A REMARKABLE FODDER VINE.

At Mr. Hugh McMartin's farm, Glen Pullen, Indooroopilly, may be seen a patch of kudzu, a leguminous plant for which great possibilities are claimed. In the United States it has a great name as stock feed and as a milk-producer. The plant at Glen Pullen has made remarkably rapid growth. In appearance it is not unlike a cowpea, but sends out long runners which root readily at the nodes. The plant is said to be a good yielder on poor soils and is so vigorous and spreads so rapidly as to soon smother weed growth. Introduced by the New South Wales Department of Agriculture about three years ago it is comparatively little known in Australia. The plant, it is said, was originally brought from Japan to America at the time of the St. Louis Exhibition for decorative purposes. In Florida (U.S.A.) it is grown on trellises about 10 feet apart, and animals are fed between the rows. It is hard to start for the first year, but after that there is no holding it. It is claimed that when established it can sustain six cows to the acre. In Florida it has yielded 10 tons of fodder per acre.

Analysis (Professor Piper, U.S.A.).—Water 69.4, ash 2.2, crude protein 5.5, fat 1.0; carbohydrates fibre 8.3, free extract 13.6.

SHOW DATES, 1922.

Inglewood: 14th and 15th March.
Pittsworth: 23rd March.
Killarney: 29th and 30th March.
Dalby: 29th and 30th March.
Toowoomba: 4th to 6th April.
Sydney Royal: 10th to 19th April.
Chinchilla: 11th and 12th April.
Herberton: 17th and 18th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Goondiwindi: 25th and 26th April.
Longreach: 2nd and 3rd May.
Wondai: 3rd and 4th May.
Grafton: 3rd to 6th May.
Toogoolawah: 4th and 5th May.
Blackall: 9th and 10th May.
Boonah: 10th and 11th May.
Emerald: 16th and 17th May.
Roma: 16th and 17th May.
Ipswich: 17th and 18th May.
Springsure: 23rd and 24th May.
Wallumbilla: 23rd and 24th May.
Maryborough: 23rd to 26th May.
Lowood: 25th and 26th May.
Beaudesert: 31st May.
Bundaberg: 1st to 3rd June.
Marburg: 2nd and 3rd June.
Gin Gin: 7th and 8th June.
Gladstone: 13th and 14th June.
Mount Larcom: 16th and 17th June.
Rockhampton: 22nd, 23rd, and 24th June.
Nambour, 5th and 6th July.
Rosewood: 19th and 20th July.
Caboolture: 20th and 21st July.
Barcaldine: 25th and 26th July.
Crow's Nest: 26th July.
Wellington Point: 29th July.
Royal National: 7th to 12th August.
Belmont: 19th August.
Murrumbidgee, 22nd to 24th August.
Zillmere: 1st and 2nd September.
Gympie: 7th, 8th, and 9th September.
Wynnum: 9th September.
Sherwood: 16th September.
Rocklea, 23rd September.
Esk Campdrafting: 4th and 5th October.
Pomona: 4th and 5th October.

PUBLICATIONS RECEIVED.

The *Agricultural Gazette of New South Wales*, for January, has among its main topics a description of "Foot Rot" of wheat, caused by the fungus *Helminthosporium*. Others matters discussed include "Cheesemaking on the Farm," "Reconstructing Milk and Cream," "Onion-growing in New South Wales," "The Energy Value of Some Dried Fruits," and "Cottage Landscape Gardening."

Bananas as Pig Feed.—Among the general notes is a reference to the value of bananas as pig feed. "The experience of farmers in the Tweed River district seems to show that pigs do well if fed on bananas, especially if the fruit is given with skim milk. Green bananas become soft if they are boiled for twenty minutes, and, although rather insipid in taste, are readily eaten. Pigs fatten well when fed in this way."

Paper Mulch for Pineapple Growing.—Another interesting note is a reference to a paper read at the annual meeting of the Hawaiian Pineapple Packers' Association. "Experiments have shown that the use of mulching paper materially increases pineapple production per acre. The idea of a paper mulch for sugarcane was patented some years ago, but no experiments with pineapples were conducted until 1919. It is estimated that there are now 461 acres planted with paper, of which 68 acres will fruit in 1922. The paper mulch appears to consist of a strip of paper in which are cut holes large enough for the pineapple plants to grow through. The first yields from the method were obtained last year, and it was found that the plants in paper grew uniformly larger, greener, and more healthy, and the fruit larger (equal to a little over 3½ tons per acre) and better conditioned. The paper mulch prevents the growth of weeds and the packing of the soil under heavy rains, thus greatly reducing the cost of intercultivation. In an experiment at the Hawaiian Pineapple Association's experiment station, the plant growth on paper mulch was three times greater in weight, and much healthier than on other plots."

The Scientific Reports of the Agricultural Research Institute, Pusa, 1920-21 (Calcutta), are very valuable, and cover a wide area in the field of rural economics.

The Journal of the Department of Agriculture, Union of South Africa, for December, has an account of "An experiment in Egg Production," embracing an interesting report on the building-up of tested laying-strains.

The Journal of the Department of Agriculture of South Australia (January) has listed among its more important features an account of the rise and progress of the South Australian fruitgrowing areas on the River Murray.

The Journal of the Ministry of Agriculture (United Kingdom) for January has among its principal contents: "Suffolk Sheep," "Berkshire Pigs," and a report of the International Labour Conference at Geneva, detailing various phases of the labour problem as applied to agriculture. The report concludes: "Probably agriculture is, of all industries, least susceptible to international regulation, but something is accomplished if this fact comes to be realised after full discussion between the parties concerned—the employers, the workers, and the Governments. From the purely national point of view, again, British agriculture stands to gain if the restrictions on the unlimited use of labour which are dictated by humanity and have become customary under our social conditions can be thus incorporated in the practice of other competing countries."

The Aberdeen-Angus Review (December) is replete with information about the great Scottish cattle breed.

The Journal of the Department of Agriculture of Porto Rico have published in bulletin form:—"An Annotated List of Sugar Cane Varieties," "The Minor Sugar Cane Insects of Porto Rico," and "Changes Wrought in the Grapefruit in the Process of Maturation."

The South African Farmers' Advocate for January discusses very seriously the general agricultural outlook. Market difficulties have, it seems, created a crisis in the Union, and the Australian rural producer is not the only storm-beaten voyager on a sea of trouble. "Kikuyu Grass' is the title of a very informative article on an aggressive drought-resisting plant that is already well known in Australia. The article explains "characteristics of Kikuyu which are not generally known, its growth in conjunction with clover, its uses for feed and other purposes, how to get the best results from it, the conclusions drawn from recent experiments, and other interesting particulars."

The Philippine Agricultural Review (No. 2, vol. xiv., 1921) presents additional data on Adlay, a grain that is receiving a considerable amount of attention in the Philippines. "Altogether it has been demonstrated beyond a doubt that adlay is a palatable and wholesome food for the table, and there is every reason to believe that with a proper mixture of wheat flour it can be used for all purposes for which wheat flour is used."

Answers to Correspondents.

THE GERBERA.

A.S.D. (Cooroy)—

Suggestion much appreciated, and will be adopted. The Curator of the Botanic Gardens (Mr. E. W. Bick) is prepared to assist readers of the Journal in matters relating to horticulture.

A very interesting and instructive paper on the gerbera was prepared by Mrs. Grenning, of Zillmere, and read before the members of the Queensland Horticultural Society. It was published in the "Agricultural Journal" of January, 1920, page 18. Mrs. Grenning is one of the most successful growers of gerberas.

THE CORAL TREE (ERYTHRINA INDICA).

D.McK. (Weir View, Goondiwindi)—

The Curator of the Brisbane Botanic Gardens (Mr. E. W. Bick) advises—

"The Coral Tree described is *Erythrina indica*. It is indigenous and abundant in Northern Queensland, New Guinea, and India. It strikes readily from strong cuttings, planted in late winter or early spring, and may also be grown from seed. It should be more largely planted, being a splendid quick-growing shade tree, and, although deciduous, when in full flower is a glorious mass of colour. It is frequently met with, grown as a shade tree, in the North and South Coast districts of New South Wales. In addition to *E. indica* there are three other indigenous species. *Erythrina vespertilio* (Bat's Wing Coral Tree, referring to the shape of the leaf), is found from the Gulf of Carpentaria down to the Clarence River in New South Wales, and inland on the Maranoa. Leichhardt, in the account of his exploration expedition to Port Essington, reports having met with it throughout. The other two species are found in the far North—one (*E. phlebocarpa*) on the Cape York Peninsula, and the other (*E. insularis*) on the islands of Torres Straits.

"There is a large number of other species of this fine tree, some of which are very beautiful—notably *E. tomentosa*, from Abyssinia; *E. Cristagalli*, from Brazil; *E. caffra*, from South Africa; and *E. Parcelli*, one with beautifully variegated foliage, from the South Sea Islands."

PEANUTS.

W.J. (Hill Top Farm, Glen Eagle)—

The Director of Agriculture (Mr. H. C. Quodling) advises—

"The clean, bright appearance of peanuts to be seen in the shops is characteristic of nuts grown on certain classes of sandy-loam soil, where there is an absence of colouring matter likely to cause discoloration or staining of the shells. Another reason is that the crop has been well harvested and cured under favourable weather conditions.

"Peanuts are also improved in appearance when preparing them for market by grading, brushing, and polishing. Attachments for these purposes are fitted to modern types of peanut-threshing machines, two of which latter are in use in North Queensland.

"Harvesting should be effected as soon as the plants, and the peanuts themselves, show unmistakable signs of maturity. If the harvesting of a ripe crop is delayed, the threadlike rootlets to which the peanuts are attached commence to decay, and, if this occurs, loss in handling is unavoidable.

"A leaflet on peanut-growing and harvesting has been forwarded."

TREE LUCERNE (CYTISUS PROLIFERUS).

T.F.I. (Caloundra)—

The so-called tree lucerne known to this Department—*Cytisus proliferus*—is grown to some extent as a hedge plant, for which it is well suited, as the plants trim well if trained when young. The leaves are not very palatable to stock.

GREASY HEEL.

J. MacA. (Peachester)—

Greasy heel is not infectious, but there is a predisposition to the complaint on the part of certain animals.

SUDAN GRASS.

A.T.J. (Wondecla, *viâ* Cairns)—

The Director of Agriculture (Mr. H. C. Quodling) advises:—

"Great care must be exercised in feeding Sudan grass to stock. It cannot be fed with safety until the plant is well out in head, and animals should be gradually accustomed to it. Cases of poisoning have occurred through turning cattle in to graze on Sudan grass paddocks, particularly where the growth was immature. From analyses made by this Department's Agricultural Chemist it would appear that sufficient hydrocyanic acid is present in green immature growth to kill cattle; whereas when the plant is in a fairly advanced condition (well out in head) there is little or no danger."

PINEAPPLES AS PIG FOOD.

G.M.B. (Beerburrum)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—

"Waste fruit can generally be fed advantageously to stock, but, when considering that pineapples contain from 83 to 90 per cent. of water and only from 10 to 17 per cent. of dry matter, consisting chiefly of carbohydrates (sugars, &c.) and only very little protein or flesh-forming food, it will be understood that very large quantities are necessary to form a proper ration, and that concentrates rich in protein must be given at the same time to give a properly balanced ration. Pineapples contain per 100 lb. only .4 lb. of digestible protein and from 10 to 13 lb. of carbohydrates, and as pigs require for every 100 lb. of live weight a ration containing 3.6 lb. of dry matter, and .45 lb. of protein, about 100 lb. of fruit would be required to give nearly the necessary amount of protein, and about 28 lb. of fruit to give the necessary amount of dry material.

"Usual rations for pigs, consisting of pollard, green lucerne, sweet potatoes, and skim milk, supply the necessary food in 14 lb. of the mixed ration for 100 lb. of live weight, and from this figure it is easily seen that pineapples could not be consumed in sufficient quantities to give a complete ration. Blood meal or meat meal, which contains about .64 lb. of protein in every 1 lb., would be a valuable aid to supply the necessary nitrogenous material, if used in small quantities.

"A complete ration for every 100 lb. live weight would consist of 2 lb. of pollard, 15 lb. of pineapples, and 4 oz. of blood or meat meal.

"The 4 oz. of blood could be replaced by about 9 oz. of linseed meal or of peanut meal, or 1 lb. of sunlight oil cake."

SULPHATE OF LIME.

W.B. (Palmwoods)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—

"Sulphate of lime of gypsum is used in place of crushed limestone or lime carbonate, particularly in the case of heavy low-lying soils inclined to be alkaline. Sulphate of lime has a more powerful action than ordinary limestone in improving the physical condition of clayey soil. Sulphate of lime could not replace quicklime to neutralize acidity in soils due to large amounts of organic matter."

CHEESEMAKING AND MARKETING.

K. McD. (Yaamba)—

The Chief Dairy Expert, Mr. E. Graham, advises as follows:—

"The local market price for cheese of first-grade quality is 9d. per lb. wholesale, and it is not expected that the price will be reduced in the near future. The value of cheese in the oversea market is now much lower than the rate prevailing during the war period, and the value of cheese in London ranges to-day from 90s. to 96s. per cwt. c.i.f.

"The natural pastures and artificially introduced Rhodes grass of your district are considered suitable as pastures for utilisation and production of milk for cheese purposes. The prevailing climatic conditions are such that provision would have to be made for the cooling of milk, otherwise the milk would probably develop too much natural acidity when kept overnight to allow of the manufacture of cheese of first quality.

"The cheese factory building, equipment, and plant to treat the amount of milk yielded by 200 cows would cost approximately from £750 to £1,000. The quantity of milk yielded by 200 cows would necessitate the installation of a small boiler for the purpose of heating the milk and providing water for cheese-factory purposes, cleansing vats, dairy utensils, floors, &c.

"There are several avenues through which instruction and advice may be obtained in the manufacture of cheese. The subject of cheesemaking may be taken up at the Queensland Agricultural College, Gatton, where an Instructor of Dairying is employed for the purpose of imparting advice and instruction in the theory and practice of cheesemaking.

"Another means whereby an insight into cheesemaking may be obtained is by the employment of a qualified cheesemaker in the factory for a season, and by someone on the dairy farm working under him and acquiring a knowledge of the work.

"There are also Cheese Instructors engaged under this Department who visit factories and give instruction and demonstration of the procedure to be followed in the conversion of milk into cheese. It is to be recognised, however, that a practical knowledge of cheesemaking is an essential to success, and this can be best acquired by the adoption of either of the former methods referred to."

SPEAR GRASS AND SILAGE.

J.J.S. (Queenton) writes:—"It is intended to chaff spear grass and place it in a silo. The silo is small (depth 9 ft.), circular, cement walls, and sunk in ground. Will the fermentation process destroy the injurious spear seeds so that the silage may be eaten by cattle without injury?"

The Director of Agriculture, Mr. Quodling, advises:—

"1. Yes. The chemical changes which take place in silage in a silo will soften the awns of the spear grass, and in this way obviate the otherwise-harmful effect of a full diet of this description. The germinating capacity of grass and other seeds is also destroyed.

"If you have maize, sorghum, sugar-cane, or some other succulent crop available, it is recommended to chaff it and mix it well in the silo with the chaffed spear grass. This latter can by no means be recommended where other fodders are available. Far more satisfactory results, after the expense of constructing the silo, will be obtained by growing a suitable fodder crop to fill it.

"Spear grass will make ensilage of a kind if cut in the soft succulent stage, just when it comes out into head, but even at this time it is not at all nutritious and does not carry very much leaf. The kind and condition of the fodder at the time it is put into a silo has a direct bearing on its subsequent quality. The best ensilage is made from succulent crops cut at a certain stage of development, *i.e.*, in the case of maize, when the grain is in the thick milk or soft dough stage; and in sorghums, when the seed is in a similar condition. Grasses, as a rule, lack that soft succulent condition necessary in a fodder to produce the best results.

"It usually takes between two and three months for ensilage to reach a certain stage of maturity, and to pass the so-called 'new' stage. If you find it necessary to use the silage, it will be quite practicable to do so, say, six weeks after it is put into the pit.

"Whenever fodder shows signs of wilting, or drying-out between the time of cutting in the field and chaffing it into the silo, it is advisable to moisten it, either with molasses in water or with weak brine. A 5-gallon drum fitted with a tap and filled with the liquid, and allowed to drip on to the chaffed fodder as it is about to be discharged, is a handy method to follow. Grass is benefited also by this moistening process.

"You are recommended to tramp the fodder thoroughly into the silo, and, when the latter is actually filled, to give the top a good watering and cover with a thickness (about 1 ft.) of well-trampled earth, and then cover as a protection from rain."

Orchard Notes for April.

THE COAST DISTRICTS.

In the orchard notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed, that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruitflies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruitflies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Strawberries can still be planted, and the earlier plantings must be kept well worked and free from all weeds in order to get a good crop of early fruit.

Scrub land intended for bananas can be felled now, as there will be little more growth, and it will have ample time to dry off properly in time for an early spring burn. Do not rush scrub falling, as it is work that pays for extra care. Lopping will improve prospects of successful fire.

Keep a keen lookout for fruitflies, and on no account allow any fallen fruit of any kind to lie about on the ground unless you are looking for trouble with the ripening citrus crop. Keep the fly in check, and there will not be any very serious losses; neglect it, and there will not be much fruit to market.

The advice given with respect to the handling and marketing of citrus fruit applies equally to custard apples, pineapples, bananas, and other fruits. In the case of bananas handled by the Southern Queensland Fruitgrowers' Association, Limited, grading is now compulsory, and it will undoubtedly tend to stabilise the market for this fruit.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Practically the whole of the fruit crop will have been gathered by the end of March, but several of the later-ripening varieties of apples grown in the Granite Belt may be kept for a considerable time, provided they are free from fly or other pests and are stored under proper conditions. Varieties such as Jonathan can be kept for some months at a temperature of 31 to 32 deg., and later varieties, such as Granny Smith and Sturmer, can be kept till apples come again if stored at the same temperature. At the same time, although storing the fruit at this temperature under artificial conditions enables them to be kept for many months, the fruit can be kept for a considerable period, and marketed from time to time as desired, by storing it in a specially constructed apple-house in or adjacent to the orchard where grown.

Such a store can be cheaply constructed in the side of a hill out of the soil of the district and slabs of timber. The soil will make excellent pisé for walls, and the roof may be constructed of slabs covered with soil. Such a store can be kept at a very even temperature, and if the air is changed during cool nights—not frosty nights—the temperature can be reduced to a low point—low enough to keep the fruit in good condition for many weeks.

All orchards and vineyards not already cleaned up must be put in order, and all weeds destroyed. Keep the surface of the soil stirred so as to give birds and insects a chance to get at any fruitfly pupæ, as it is necessary to destroy this pest whenever there is a chance of doing so.

Land intended for planting during the coming season should be got ready in order to expose the soil to the cold of winter, thus rendering it sweeter and more friable.

If there is any slack time in the course of the month, go over all surface and cut-off drains and put them in good order. Also, if during periods of heavy rain, soft or boggy spots have made their appearance in the orchard, do what draining is necessary, as badly drained land is not profitable orchard land, and the sooner it is drained the better for the trees growing upon it. Soft or boggy spots are frequently caused by seepage of water from a higher level. In this case a cut-off drain will be all that is necessary, but where the bad drainage is due to hard pan or an impervious subsoil, then underground drains must be put in. After draining, the land should be limed. Liming can be done now and during the following three months, as autumn and winter are the best times to apply this material.

When the orchard soil is deficient in organic matter (humus) and nitrogen, try the effect of green-crop manuring, planting the grey or partridge pea and manuring the ground for this crop with a good dressing of finely ground island phosphate or basic phosphate.

Where citrus fruits are grown, they should now be ready for marketing. If the land needs it, it should be given an irrigation, but unless the trees are suffering from want of water it is better to stick to the use of the cultivator, as too much water injures the keeping and carrying qualities of the fruit.

The remarks on the handling and packing of citrus fruits in the coast districts apply to the inland districts also, but these districts have an advantage over the coast in that, owing to the drier atmosphere, the skin of the fruit is tougher and thinner, and in consequence the fruit carries better.

Farm and Garden Notes for April.

Field.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April:—Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in last month's journal.

Potatoes planted during February should be now showing good growth, and must be kept well cultivated by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and, where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat, *i.e.*, those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

Kitchen Garden.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally, except cucumbers, marrows, and pumpkins. In connection with these crops, growers are recommended to adopt some form of seed selection for the purpose of improving the quality of vegetables grown by them. Just at present, selections should be made from all members of the cucurbitaceæ (pumpkins, cucumbers, &c.). Tomatoes should also be selected for seed. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·0	6·51	5·24	6·46	5·45	6·25
2	5·1	6·51	5·25	6·46	5·45	6·24
3	5·1	6·51	5·26	6·45	5·46	6·23
4	5·2	6·51	5·27	6·45	5·46	6·22
5	5·3	6·52	5·28	6·44	5·47	6 20
6	5·4	6·52	5·28	6·43	5·48	6·19
7	5·4	6·52	5·29	6·42	5·49	6·18
8	5·5	6·52	5·30	6·42	5·50	6·17
9	5·6	6·52	5·31	6·41	5·50	6·16
10	5·6	6·52	5·31	6·41	5·51	6·15
11	5·7	6·52	5·32	6·40	5·51	6·14
12	5·8	6·52	5·33	6·39	5·52	6·13
13	5·9	6·52	5·34	6·38	5·52	6·12
14	5·9	6·52	5·35	6 38	5·53	6·11
15	5·10	6·52	5·35	6 37	5·53	6·9
16	5·11	6·52	5·36	6·36	5·54	6·8
17	5·12	6·52	5·37	6·35	5·54	6·7
18	5·12	6·52	5·38	6 34	5·55	6·6
19	5·13	6·52	5·38	6·34	5·55	6·5
20	5·14	6·52	5·39	6·33	5·56	6·4
21	5·15	6·51	5 39	6 32	5·56	6·3
22	5·16	6·51	5·40	6·31	5 57	6·2
23	5·17	6·51	5·40	6·31	5·57	6·1
24	5·18	6·50	5·41	6·30	5·58	5·59
25	5·19	6·50	5·41	6·29	5·58	5·58
26	5·19	6·50	5·42	6·28	5·59	5·57
27	5·20	6·49	5·43	6·27	6·0	5·56
28	5·21	6·49	5·44	6·26	6·0	5·55
29	5·22	6·48	...	...	6·1	5·54
30	5·23	6·48	...	...	6·1	5·53
31	5 ·23	6·47	...	...	6·2	5·52

PHASES OF THE MOON, ECLIPSES, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when summer time is not in force.

		H. M.
6 January	☾ First Quarter	8 24 p.m.
14 „	○ Full Moon	12 37 a.m.
20 „	☽ Last Quarter	4 0 p.m.
28 „	● New Moon	9 48 a.m.

Apogee on 3rd at 8·54 a.m.
„ on 30th at 10·24 p.m.
Perigee on 15th at 9·48 a.m.

5 February	☾ First Quarter	2 52 p.m.
12 „	○ Full Moon	11 18 a.m.
19 „	☽ Last Quarter	4 18 a.m.
27 „	● New Moon	4 48 a.m.

Perigee on 12th at 9·0 p.m.
Apogee on 27th at 12·48 a.m.

7 March	☾ First Quarter	5 22 a.m.
13 „	○ Full Moon	9 14 p.m.
20 „	☽ Last Quarter	6 43 p.m.
28 „	● New Moon	11 3 p.m.

Perigee on 13th at 9·30 a.m.
Apogee on 26th at 5·36 a.m.

The splendid phenomenon of an annular or ring-shaped eclipse of the sun will be seen, if clouds do not intervene, in North Africa (including part of the Suez Canal) and in South America on 27th and 28th March.

The only other eclipse of the year will be the Great Australian Total Eclipse of the Sun on 21st September, of which special particulars will be given.

The apparent proximity of the moon and Delta Tauri early in the evening of 9th January will be of interest to those who possess telescopes or binoculars, also the occultation of Omicron Leonis on the 16th, about 1 o'clock in the morning. On 7th February Delta Tauri will be occulted by the moon about 4 o'clock in the morning, also another small star in the same constellation half an hour later, followed by another within three quarters of an hour after that.

The occultation of Jupiter by the moon on 16th February will unfortunately occur about sunrise at Brisbane, but may be observable at Oontoo, Birdsville, and other places in the far south-west.

The planet Jupiter will be coming into view before midnight in February and March; Venus will pass from west to east of the sun on 9th February; and Mercury from east to west on the 14th. Before the end of March Jupiter and Saturn will be prominent evening stars.

On 21st March the sun will rise almost exactly due east, and set due west, passing from south to north of the equator.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XVII. APRIL, 1922. PART 4.

DAIRY CONFERENCE.

Advisory Board Appointed.

Organisation of the Agricultural Industry.

"That an advisory board for the dairying industry of Queensland be appointed by this Conference ; such board to have a provisional tenure of office not exceeding one year pending the constitution of a general council of agriculture, district councils, and local producers' associations.

"That the objects of the advisory board include the following :—

(a) To consider the question of investigating, in conjunction with the Department of Agriculture and Stock, the problems relating to the dairying industry of this State ;

(b) To investigate the methods of production, manufacture, marketing, storage, and distribution of dairy produce ;

(c) To consider the question of the establishment of pools for dairy produce ;

(d) To consider the question of the co-ordination of the activities of existing co-operative companies ;

(e) To consider the question of the improvement of the productiveness of the individual dairy herds by general application of systematic herd testing or any other efficacious means ;

(f) To consider the question of the purchase of all factory and farm requisites through co-operative channels ;

(g) To consider the question of fodder conservation ;

(h) To consider the question of extending the benefits of the Co-operative Agricultural Production and Advances to Farmers Act, or any other means for the establishment of rural credit.

"That this Conference approves of the scheme of organisation outlined by the Premier, and is of opinion that necessary action be taken to bring the scheme into operation at once."

The foregoing resolutions were unanimously adopted on 24th March at one of the most important gatherings of primary producers in the history of the State.

A NOTABLE GATHERING.

A conference of representatives of dairying interests within the State, convened by the Premier, the Hon. E. G. Theodore, was held in the Land Court Room, Executive Building, Brisbane, on 24th March, 1922.

The gathering was one of the most notable in the history of Queensland, and its decisions are of first importance to all engaged in rural pursuits. Following is a full report of the Conference.

The proceedings were opened by His Excellency the Governor, the Right Hon. Sir Matthew Nathan, G.C.M.G. The Minister for Agriculture (the Hon. W. N. Gillies, M.L.A.) presided, and with him on the platform was the Premier (Hon. E. G. Theodore, M.L.A.).

The delegates and interests represented were—

Present:

Secretary for Agriculture (Hon. W. N. GILLIES, M.L.A.), Chairman.
The Premier (Hon. E. G. THEODORE, M.L.A.)

BUTTER FACTORIES.

Atherton Tableland Co-operative Butter Company	SLOAN, W. J.
Bundaberg Co-operative Dairy Company	GREATHEAD, J.
	CROWE, G. F.
Caboolture Co-operative Dairy Company	DOBSON, F. J.
	POPE, W. E.
Central Queensland Co-operative Dairy Co., Rockhampton	PRITCHARD, E. G.
Central Queensland Dairymen's Co-operative Company	JOHNSON, R.
	MCDONALD, G. E.
Chinchilla Co-operative Dairying Company	HOLMES, W.
	WARREN, H. T.
Dawson Valley Co-operative Dairy Company	PATERSON, S. D.
	LEPLA, L.
Downs Co-operative Dairy Company	MITCHELL, F. A.
	PURCELL, J.
	MORWOOD, H.
Esk Co-operative Dairy Company	GRAHAM, G.
	RUTKIN, F.
Farmers and Producers' Co-operative Dairy Company, Rockhampton	CONAGHAN, T.
Goombungee Co-operative Dairy Company	DASCOMBE, LEWIS
Killarney Co-operative Dairy Company	PETERSEN, C.
Kin Kin Co-operative Dairy Company	HAPGOOD, W. C.
	MCINTYRE, W. L.
Logan and Albert Co-operative Dairy Company	PLUNKETT, T. FLOOD
	HOPKINS, JOS.
Maleny Co-operative Dairy Company	HOLTON, A.
	BRYCE, CHAS.
	ALCORN, J.
Maryborough Co-operative Dairy Company	NOAKES, G. R.
	DEAN, J. E.
	WICKAN, J. S.
Nanango Co-operative Dairy Company	PERRETT, CHAS. E.
Oakey District Co-operative Dairy Company	ARCHIBALD, J.
	GRAY, A. C.
	DEARLING, —.
Port Curtis Co-operative Dairy Company	KESSELL, J. H.
Queensland Farmers' Co-operative Dairy Company, Booval	RYAN, D.
	PENDER, J.
	STEVENS, H. M.
Rockhampton District Co-operative Dairy Company	FISHER, A. E.
	NUTTALL, J. W.
Roma Co-operative Dairy Company	NIND, L. W.
	HEMBROW, R.
South Burnett Co-operative Dairy Company	WITTON, E. W.
	HARTLEY, W. S.

MEMBERS OF THE REPRESENTATIVE DAIRY CONFERENCE, HELD IN BRISBANE, 24TH MARCH, 1922, IN CONNECTION WITH THE ORGANISATION OF AGRICULTURE

Convened by the Premier . . HON. E. G. THEODORE
Chairman of Conference, The Minister for Agriculture, HON. W. N. GILLIES

South Queensland Co-operative Dairy Company	Winnett, W. G.
Stanley River Co-operative Dairy Company	Carseldine, H.
	Bateman, Chas.
Terrors Creek and Samson Vale Co-operative Dairy Co.	Rudd, E.
Warwick Co-operative Butter and Dairy Company	Buckley, Jas.
Wide Bay Co-operative Dairy Company	Betts, T. E.
	Parkyn, R. B.

CHEESE FACTORIES.

Biddeston Co-operative Dairy Company	Anderson, H. T.
	Little, W. H.
Cambooya Dairy Company	Buchanan, S. B.
	Berry, James
Cooranga North Co-operative Cheese Company	Hopper, N. C.
Dundarrah Co-operative Cheese Company	Marshall, John
Emu Creek Co-operative Dairy Company	Thomas, C.
Felton Co-operative Dairy Company, Limited	Fitzgerald, E.
	Gauld, F.
Gowrie Junction Cheese Factory	Hitchcock, C. M.
Greenmount Dairy Company	Bermingham, P. W.
	Strickland, P. L.
Irongate Co-operative Dairy Company	Brady, T.
Kaimkillenbun Co-operative Cheese Company	Skerman, P. J.
Kooroongarra Co-operative Dairy Company	White, P.
	Paterson, S. L.
Lauriston Co-operative Dairy Company	Stehn, F. G.
Leyburn Dairy Company	Kirby, Richard D.
MacLagan Valley Co-operative Dairy Company	Cole, E.
	Reed, J.
Malling Creek Co-operative Factory	Hansen, M. P.
Memerambi Co-operative Cheese Company	Shailer, W.
Mount Sibley Co-operative Dairy Company	Bellingham, Wm. R.
	Peters, C.
Mount Tyson Farmers' Co-operative Dairy Company	Stower, R. J.
	McIntyre, C.
	Ruhle, P.
Pittsworth Dairy Company	Keefer, H.
Rocky Creek Co-operative Dairy Company	French, T.
	McCullough, R.
Rodger's Creek Cheese Factory	Pentecost, H. L.
Southbrook Co-operative Dairy Company	O'Shea, D. G.
Sugarloaf Co-operative Dairy Company	Freyberg, H.
Tummaville Co-operative Dairy Company	Crocker, Richard
Yargullen Co-operative Dairy Company	Peters, E.

GENERAL.

Australian Dairy Farmers' Association	Power, P. K.
Australian Dairymen's Association	Douglas, A. S.
Brisbane Butter Pool	Kelso, W.
Cheese Manufacturers' Association	Purcell, W.
Commonwealth Dairy Produce Pool Committee	Galbraith, A. C.
Drillham	Nixon, A.
Farmers' Alliance	Wight, R.
Fassifern District Council (Q.F.U.)	Shaw, T.
Gin Gin Dairymen's Association	Cromarty, J. F.
Gunalda	Currant, W. G.
"Livestock Bulletin"	Maynard, R. S.
Maroon	Rose, S.
Pinelands, *via* Crow's Nest	Adams, J. S.
"Producers' Review"	McAnally, H.
Queensland Cheese Manufacturers' Association	Turrell, E.
Queensland Co-operative Dairy Companies' Association	Tod, J. T.
	Harris, W. T.
Queensland Farmers' Union	Austin, J. A.
Standard Dairy Company (Condensed Milk)	Stafford, E.
Toogoolawah Dairymen's Association	Nott, F. L., M.L.A.
Wyreema Milk Suppliers' Association	Burton, G.

REPORT OF PROCEEDINGS.

THE GOVERNOR'S OPENING ADDRESS.

The CHAIRMAN said he had great pleasure in calling on His Excellency the Governor to welcome the delegates and formally open that important Conference.

HIS EXCELLENCY THE GOVERNOR (Sir MATTHEW NATHAN, G.C.M.G.), who, on rising, was received with applause, said he had had the pleasure of meeting some of the delegates before, but on occasions less important than the present one when they were going to discuss what seemed to him to be the greatest factor in the future of Queensland. The problem that loomed above all others in Australia was how to obtain a large virile population, and the solution of that problem he believed to be in agriculture. Mining, other than coal and iron, was never more than temporary, and though there might be—indeed, he hoped there would be—a revival in the mining of Queensland, the permanent prosperity of the country must have another basis. A very large proportion of this country was fit for grazing but not for agriculture: therefore they must keep their wool trade and must get back their beef trade. In the fullness of time, no doubt, they should have secondary industries, but there was little likelihood of their being able to compete with the products of those industries in the markets of the world, and they would have to succeed rather than to precede any increase in population. It was increased agriculture alone that could bring about closer settlement on which the safety and wellbeing of Australia must depend. There was only one way in which such increase could be brought about, and that was by the work of farming being made profitable to the farmer. (Hear, hear!) Undoubtedly he derived profit in body and character from living the most healthy of lives, but he must have something more than that. He must be able to gain from the hard work of his life sufficient to enable him to establish a good home, to bring up a long family as they should be brought up, and to secure for himself in old age, if not affluence, at any rate reasonable comfort and wellbeing. (Hear, hear!)

The Farmer's Business.

The farmer's business, as, indeed, most other businesses that were not wage-earning, was of a speculative nature. In agriculture that element was introduced mainly by the waywardness of Nature, but with knowledge and industry provision could be made to minimise if not to remove the effects of drought, floods, pests, and diseases. This had to be done largely by the efforts of the individual farmers; but there were other elements of uncertainty that could be got over, and of success that could be achieved by the farmers working together. Co-operation could reduce the difficulties arising from fluctuations of particular markets and keep down the charges which accumulated between the cow and the counter, the field and the factory. It could

improve produce and so heighten its value; and it could improve the producers' lives and so heighten their enjoyment of life. The Premier would explain the lines on which those matters would be discussed. All he (His Excellency) could do was to appeal to those present to make the discussion as free, frank, and full as possible, so that it might be fruitful. He was sure that the Government wished them to speak out their minds in all matters bearing directly on the subject before them. They wanted to know the difficulties of the farmers, not for polemical purposes but with a view to seeing how they could be overcome, and the delegates present, in their turn, should each put forward his case, not so much with a desire to make points in the argument as to arrive at definite conclusions of which a practical trial could be made. That would be a great day if it led to some betterment in the lot of the man on the land and so to new men going on to the land, taking advantage of natural conditions that were as favourable to farming as any in the world. He had great pleasure in welcoming those present and in declaring the Conference to be open. (Continued applause.)

Vote of Thanks to His Excellency.

The CHAIRMAN asked those present to carry a hearty vote of thanks to His Excellency for that very fine speech of his and piece of good advice. He was reminded while His Excellency was speaking of the day when he met His Excellency when he landed in Queensland. On that occasion he, as Minister for Agriculture, felt a little bit disappointed, because in His Excellency's first speech at Parliament House he expressed regret that he did not possess the great knowledge of agriculture that his predecessors had possessed. It was not long, however, before he learned that not only did His Excellency possess that knowledge of agriculture, but that he was more sympathetic towards and more desirous of benefiting agriculture than any of his predecessors had been, and therefore he asked the delegates to carry a hearty and cordial vote of thanks for His Excellency's speech.

(Carried with acclamation.)

THE POSITION OF THE DAIRYING INDUSTRY.

Address by the Minister for Agriculture.

The CHAIRMAN (Hon. W. N. Gillies): As Chairman of the Conference he was not going to take up very much of their time, although there were many things about which he would like to talk to them. First of all, he would like to apologise for the hurried nature of the summons to the Conference. Unfortunately, the furthest outposts of dairying in Queensland were not able to be represented at the Conference—such as his own electorate, the Atherton Tableland, which was an important dairying centre now and capable of great expansion—because of the shortness of time and the distance away from Brisbane. However, on looking round the room he thought the gathering was fairly representative of the industry. He saw some of the great pioneers of the co-operative movement before him, and he was sure that after all their work they could exclaim with the late Cecil Rhodes, who, on his deathbed, said, "So little done; so much to be accomplished." At that gathering they might very well "Let the dead past bury its dead" and look to the future, but, in the words of the poet, "Act in the living present." That was the great concern—the living present. Each delegate had received a copy of the agenda paper and some of the resolutions that were to be submitted to the Conference, and those resolutions he would like them to look carefully through, because the matter was entirely in their own

hands. That Conference was an important one. It was the first of a series of Conferences that were to be held in connection with all branches of the agricultural industry.

Necessity for Immediate Action.

The reason for calling the Dairy Conference so hurriedly was because of the unfortunate position the industry found itself in at the present time, and the Government wanted to take some immediate action that would benefit the industry. However, his advice was to be certain that anything that was settled was settled in the right way. Any immediate gain that was not right was not likely to be good to the industry. The industry was a great one, and capable of great expansion, and the foundations they laid to-day should be on a solid and lasting basis. As one great poet had said, "Nothing is ever settled unless it is settled right." Unless they settled their questions right they would come up again. He hoped that they would be able to lay down the basis of a system which would be of lasting benefit to the great dairying industry. He wished to read the wire which had been sent out convening the Conference. If the meeting was not representative, as he had just said, the blame could hardly be attached to any one, because the time was so short, and the Government were urged to call the Conference straightaway, so as to try and solve some of the problems in the dairying industry. The wire, which had been sent out to all butter and cheese factories and condenseries in the State, read—

> "You are invited to send two representatives your company one to be a supplier to meet Premier and myself at Land Court Room Executive Buildings Brisbane Friday 24th March, 10 a.m., discuss better organisation of dairying industry with object improving producers' position. Department pays railway fares. Please inform Under Secretary early representatives' names."

A paragraph was also inserted in the Press inviting representatives from all recognised dairying associations. In response to that invitation there was a fairly representative gathering present.

A Few Facts and Figures.

He thought he might be permitted, before calling on the Premier to address the Conference on the general policy of the Government, to give a few facts and figures regarding the dairying industry, which would be of benefit not only to the industry itself but to the general public, as showing the importance of the industry at the present time. The dairying industry in Queensland might be said to be about 25 years of age, as it was about 25 years since the industry took a real start in Queensland. In 1895 there were manufactured in Queensland 3¾ million lb. of butter, in 1910 31¼ million lb. of butter, and in 1920 40¾ million lb. of butter. The production of cheese during the same years amounted to 2 million lb., 4 million lb. and 11½ million lb. respectively. During last year there were manufactured in Queensland 4½ million lb. condensed milk. That showed the strides that had been made in the dairying industry in a quarter of a century. During the last three years 67½ per cent. of the butter and 75 per cent. of the cheese manufactured in Queensland were consumed in Australia, showing the importance of the industry to Australia, and that the industry at the present time largely depended on the Australian public for a market. He sincerely hoped that the dependence of the industry on the Australian public for a market would be increased instead of decreased—that the public would come to Australia to consume the butter, instead of it having to be sent overseas. With regard

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to butter, last year Queensland exported 654,623 boxes of butter and New South Wales 644,683 boxes, showing that last year Queensland exported more than New South Wales. Victoria exported 727,707 boxes of butter last year, being slightly in the lead as regards Queensland, but it should be borne in mind that Queensland supplied the Southern States in the winter months with their local requirements. If a deduction were made on that account, he thought it would be shown that Queensland was the biggest exporting State with regard to butter. The value of the industry to-day was approximately 6½ millions sterling, showing that the great dairying industry, with all its drawbacks, disadvantages, and handicaps, was chasing the sugar industry very closely. While it must be recognised that the industry has made phenomenal strides within the early years of its history, it is also manifestly plain that the avenues for further expansion are enormous, and the possibilities are that greater progress will be made in the immediate future than has been achieved during former years.

Better Organisation and Capable Control.

Better organisation and a more capable control and management of the industry by those directly concerned would result not only in the stabilisation of the industry as it exists to-day, but it would provide the foundation for the successful development of the industry upon many thousands of acres of suitable lands, which, so far, have not been utilised for dairy purposes. The acreage of land suitable and available for dairying in Queensland is far in excess of that on offer by Southern States, where the industry has been longer established, and most of the suitable lands are at present in use for dairy purposes. In the Central district and on the Burnett watershed there are thousands of acres of land which are classed as being serviceable for dairying purposes, and, although two butter factories are supplied with cream raised upon the Atherton Tableland, there is room in the far North for great expansion if the price is right. But there are other channels whereby the production of dairy produce may be augmented, and the proceeds from the dairy farms appreciably enhanced, without adding to the acreage of the existing dairy farms or increasing numerically the dairy herds. The principal essentials are comprised in the better organisation of the industry from a producer's standpoint, leading up to:—

(*a*) Improvement in methods of farm management and animal husbandry.

(*b*) Improvement in productiveness of the individual dairy herds.

(*c*) Improvement in quality of dairy produce raised on the farm.

(*d*) Reducing to a minimum the difference between the price returned to the producer of dairy produce and that charged to the consumer.

Herd Testing.

The several matters I have mentioned lay bare a field for increased revenue for the producer that so far has not been exploited, but the matters enumerated are of vital importance, and are to be viewed as constituting the foundation of any effective scheme for the betterment of the industry as a whole, and by no other means is it possible for the individual dairy farmer to derive any substantial monetary benefit from the industry. Referring more specifically to the need for improvement in the productiveness of milch cows, he said the Agricultural Department had a system of herd testing which, in his opinion, was a good one. It might be benefited by the establishment of local herd testing societies, as in New South Wales, but he had his doubts about that. If the

Conference had any suggestions to make for improving the system of herd testing, they would be very pleased to get them. They had approximately 448,000 cows utilised for the production of milk in Queensland. Of that number 113,000 were returned as "dry." In all, more than 7,000 milch cows were submitted to a test last year, and calculated on a commercial butter basis the production of dairy cows in Queensland worked out at about 106 lb. per cow.

The Example of Denmark.

It may not be fair to point to Denmark's average of 400 lb., for they must realise that Denmark was a very old country, with marketing advantages over Queensland; but some disadvantages also—climatic conditions, cost of land, high rents, and so on. But while not pointing to Denmark as something which we can accomplish in Queensland, immediately it would be admitted by every practical farmer that Queensland must increase its average to more than 106 lb. per cow per annum. (Hear, hear!) That could be done with the co-operation of the farmers and the Department. He had never once said that the Department of Agriculture was doing half of what it should do; it should do a great deal more. Any suggestions made by that Conference of practical men would, if possible, be given effect to. Denmark 27 years ago started testing with a production of 122 lb. per cow, and they had now got from 122 lb. per cow to 400 lb. per cow. If they could increase their output in Queensland from 106 lb. per cow to 212 lb. per cow in a few years, they could imagine the effect it would have on the industry and on their banking accounts. He hoped the time would come when, instead of the Department having to enforce regulations which some of the farmers considered objectionable with regard to dairy premises, the united body of dairy farmers throughout Queensland would be able to tell the Department, through their Central Advisory Board, what they wanted, and see that such regulations were properly enforced. That was the position in Denmark. There was no need for the State to do those things if the farmers would do them themselves.

He wanted them to take particular notice of what the Premier said, and he would suggest that, after the Premier had finished his speech, there should be a limitation of time in regard to speeches, so as to secure expedition of business, while not desiring to curtail debate. He did not care if they were here for a week if they were doing good business. (Applause.)

THE PREMIER'S SPEECH.

The PREMIER, who was received with applause, said it was not his intention that morning to outline a party political programme. They wanted to keep the conference as free as possible from party bias or party entanglements. The Government wanted to express its attitude and opinions with regard to what was necessary to meet the situation affecting the agricultural industry, and especially the dairying industry in Queensland. Agriculture was almost stagnant at the present time, and had been so for years. There were literally millions of acres of land in Queensland suitable for cultivation, or, at any rate, close occupation by agriculturists, but there was no great development taking place at the present time. He was well aware that there were certain factors that had hampered agricultural development in recent years. The effect of the war taking away a large number of young men from the community and necessitating the concentration of effort upon other things for a number of years, had prevented any normal development or extension of agricultural and land settlement; and during the last two or three years trade depression and financial stringency, and the aftermath of the war in respect to credit deflation,

had had the effect of preventing the launching of any large scheme for the extension of agriculture. These facts had to be recognised in order to thoroughly appreciate the present situation, but even allowing for all these factors it could not be denied that the agricultural industry was not on a satisfactory footing. The Government desired to see, as His Excellency had pointed out, a greatly increased virile population in Queensland, and the best way to get that was to get men to go on to the land and to increase wealth production to provide the means for the support of the additional population. (Hear, hear!) But it was not to be wondered at that land settlement was proceeding slowly when one realised the unsatisfactory conditions existing in the agricultural industry in Queensland. While men who were on the land considered themselves not sufficiently remunerated—while the people in rural districts considered themselves neglected, and there was a general atmosphere leading to the impression that there was no encouragement for a man to go on the land—there would be no great progress towards the extension of rural industries.

A Vital Necessity.

The Government had therefore recognised the vital necessity to this State of taking fully into account the problems facing the agricultural industry, and by giving intelligent consideration to those problems to endeavour to overcome them. He was not saying that the policy which the Government outlined was a policy which had been discovered by them alone. The Government did not wish to take all the credit for originating the proposals that would be placed before the Conference that day. For many years, others had recognised the necessity for similar action; but the time had arrived when the farmers—the men mostly concerned—were willing to accept Government co-operation and assistance, and were willing themselves to co-operate with the Government in endeavouring to solve the problems which were capable of solution. One of the difficulties which existed in connection with the agricultural industry—and in referring to agriculturists he was not confining it to the cultivators of the soil alone—but he was speaking of the industry in its broadest sense as embracing farmers, wheatgrowers, canegrowers, small graziers, and the whole body of general farmers in this State. One of the things that had militated against the solution of many problems relating to farming had been the lack of organisation amongst the farmers themselves. That lack of organisation—the lack of any common aim and the absence of any common objective had led to the chaotic condition which must necessarily follow when they had one body of farmers pulling against another body of farmers.

Absence of Organisation.

This absence of organisation had led to a condition of absolute disorganisation amongst the farmers in various parts of the State. He thought the situation was capable of being improved. So long as the farmers recognised the necessity of associating amongst themselves and using their combined force and power and intelligence, they could solve, or be the means of the solution of, many of the main problems that were facing the industry to-day. There was at present a certain degree of organisation. He wanted them to understand that he did not wish in any way to reflect on the organisations that existed amongst the farmers at present, but unhappily hitherto the organisation amongst the farmers had been the result of a desire to use the farmers as a party political force. That, of course, was fatal to the success of any organisation amongst the primary producers. (Hear, hear!) He had

recently outlined in a series of speeches below the Range and on the Downs what he thought might be accomplished by having an effective organisation amongst the farmers, controlled by the farmers, and free of any party entanglements whatever. (Hear, hear!)

The Case for Combination.

There should be an organisation amongst the farmers just the same as they found organisations amongst other sections of the community. They should have organisation amongst the farmers just as they had it amongst the wage-earners and other bodies. The merchants were organised through their various chambers of commerce; the employers and manufacturers were organised in their various associations; the bankers were organised, and also the shipowners—in fact, nearly every section was organised except the farmers themselves; and because of all this organisation elsewhere the farmer had to a large extent been left in the lurch. The necessity then arose that the farmer should organise for his own protection, in order to combat successfully the organisation that was in existence elsewhere. (Hear, hear!) Organisation was a *sine qua non* for the solution of many of the problems facing the agricultural industry in Queensland to-day. He had no doubt that the general remarks he made about the agriculturists in Queensland, and the need for organisation, applied with equal force to the agriculturists in other States, but in Queensland they were concerned with their own affairs first, and they had to solve the problem of organisation effectively and intelligently first, and then, as a result of solving the problems in Queensland, no doubt they would be emulated elsewhere. (Hear, hear!)

An Advisory Board.

He had read criticisms against an advisory board being established in Queensland, because it would apply to Queensland alone and would not affect the agriculturists in other States. It was no reason that they should refrain from taking action just because they had to confine their efforts to their own State. They must start somewhere. If they were able to prove what the effects of organisation and close co-operation were, then no doubt the other States would readily follow on the same lines and co-operate with them and the whole of their organisation would be made effective throughout the Commonwealth. There were a great many problems to be considered by the farmers and in the interests of the farmers in this State. These problems were more complex and in greater number than the problems facing any other industry in this State or in any other class of business. Such problems might be classified as social, economic, political, and educational. By political he did not mean party political. There were a lot of problems relating to the welfare of the farmers which required political attention apart from party politics. There were many matters relating to the farmers which required legislative enactment and administrative action, and it was in that sense that he referred to it as political. He did not suggest that the farmers should eschew all political action so far as their affairs were concerned. The farmers were interested politically in many matters such as the settlement of the Customs tariff. They were intensely interested in the details of the tariff; and they should be able to voice their opinions on the tariff and suchlike matters. And, of course, in their own party organisations the farmers should be able to enjoy as much freedom of action in party political matters as any other citizen, but in the organisation of the agricultural industry they should keep party politics out of it altogether. (Hear, hear!)

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Economic Problems.

The economic problems were those which, for instance, pertained to the grading and the standardisation of their products in order to meet with the improved marketing conditions. Then there was the question of manufacture of farm products into secondary products, the question of improved methods of production, and of cold storage. The price fluctuations and market fluctuations were matters that closely concerned the farmers and dairymen; so that it was necessary for them to have an organisation which was constantly studying these conditions, gathering accurate statistics, and watching the movements of prices on the oversea markets, and if they had that organisation they would be able to advise the farmers promptly and accurately on all these matters. Then there were such questions as pests, diseases, droughts, and such questions as water conservation, storage of fodder, and innumerable economic problems which arose in the every-day life of every man on the land. All these could be best dealt with by organisation. These things vitally concerned the man on the land. When they had their organisation complete they could employ experts for the benefit of the organisation. It would go a long way towards enabling the farmers, as a body, to formulate a workable policy to put before the Government to carry out. These were the economic phases of the question. He mentioned the political phase because 50 per cent. of the Acts passed dealt directly or indirectly with the man on the land. In passing that legislation the Government had no organisation at present that they could consult with with regard to the details of that legislation.

Beneficial Legislation.

They had passed Stock Acts, Pure Seed Acts, Registration of Stock Acts, Acts relating to co-operation and dealing with pools such as the Wheat Board and Cane Prices legislation, and legislation relating to the dairying side of the question. The Minister had already spoken of the inestimable advantage it would be to the Government as well as to the farmers themselves if they had an organisation which could deal impartially with all questions and furnish advice on legislative proposals. In this way a farmers' organisation would be of great value to the State. If the farmers had such an organisation, and they considered all these questions to submit to the Government, then they would be really responsible for framing the legislation and shaping the policy for the development of agriculture as an industry. Then there was the educational side. It struck him as anomalous that in a State like Queensland, which had to depend so much on the agricultural development of its lands, whose whole future was wrapped up with the development of agriculture, the men on the land themselves occupied a relatively inferior status in the community. This was because of the mistakes made by the farmers generally owing to their lack of proper organisation or of proper means of fully informing the public mind as to what is the relationship of the farmer as a unit in the social structure.

The Status of Farmers.

The farmer occupied a relatively inferior status to-day. At any rate, that was the general conception in the public mind. If they saw a cartoon of a farmer in the papers, he was generally depicted as some kind of horny-handed old hayseed who was incapable of thinking of anything but his plough, or whatever particular implement he happened to be using. It was because of that that the farmers' sons were gravitating towards the cities. The farmer's son did not want to think that the only career in life open to him was to become a cocky. (Laughter.) He appealed to them to see that organisation would improve the status of the farmer

and would remove that erroneous conception in the public mind. In England and America the farmer would never allow himself to be thought of as an inferior person. Certainly, he would not think himself inferior to a clerk or a quill driver, or to a man punching a typewriting machine. It was the same in Canada, and they could improve the status of the farmer in Queensland in the same way. If they improved the position of the man on the land they would make the agricultural population what it was destined to be—the backbone of the country. They did not want the man on the land to be looked on as something inferior in social status, and that was something the farmers could accomplish for themselves by a proper organisation of the agricultural industry and by the dissemination of educational propaganda give to the public a truer conception of the farmer's worth. In some cases, he did not say it applied to the men assembled before him that morning, but they knew of cases where the farmer was ground down and became a hard-working industrial slave. (Hear, hear!)

A VOICE: That is what he is.

Present Day Conditions.

The PREMIER: They knew in some cases that the man on the land toiled under conditions of absolute drudgery and hopelessness, but that should not be. In the early days of the colony it was necessary for the farmers to go out into the country miles away from railways and pioneer the land. In those days the farmers had no means of establishing settled communities with any degree of comfort. They were the real pioneers of the country, and all honour to them for the pioneering work which they had done. Although they could honour the pioneer of the past, because a man had to pioneer 50 years ago, there was no necessity to-day why the man on the land should be living a life of hardship and suffering from almost the same disabilities as the pioneers of old. There was no necessity for that, although, unfortunately, a majority of them were doing it. It might be said he was outlining some kind of a visionary policy to be attained some time in the distant future. His own belief was that if the farmers in Queensland were strongly organised—they constituted so large a class and so important a section in the community that, if they were strongly organised, and with the co-operation and sympathy of the Government, they could improve all those things relating to rural life.

The Oldest and Noblest Science.

He was referring to the necessity of attending to the educational functions of an organisation of that kind. It was necessary to carry on propaganda amongst the public in order to improve the status of the farmers and all farming industries. It was also necessary to have propaganda for other purposes—propaganda amongst the public in order, if necessary, to increase the consumption of farm products. That was an important matter. It was also necessary to remodel the State educational system in order to give more attention to agricultural education. That was a very important factor indeed. Agriculture was a science—the oldest and noblest science known—(hear, hear!)—but, unfortunately, speaking generally, it was not carried on as a science in Queensland. There were very few men—if he was correct in what he had been told, because he could not speak from personal experience in those matters—there were very few men who carried on farming operations on scientific lines in Queensland. It was necessary for them to take advantage of the discoveries of science and the experience of other countries, and apply them to agricultural production in this State.

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Agricultural Education.

But, in order to apply science, it was necessary to have a system of education. They could not expect a man who was born in a farming district and had lived on a farm all his life, and had no other tuition, to thoroughly understand the science of agriculture. It was necessary to have imparted to him the common experience of the whole world attained through a long series of years, and after patient research by experts. It was necessary to have that knowledge imparted to the youthful farmer in order that he might become a scientific farmer. The farmers could assist the Government a great deal through their organisations to improve the system of agricultural education—he did not know that he would be justified in calling the present limited kind of agricultural education that was carried on in Queensland a system of education at all, but it was possible to develop it; to have a course of secondary agricultural tuition linked up with the primary schools, and, if necessary, with the University, at which those men who decided upon an agricultural career could, in their early days, get the necessary scientific tuition. The delegates might think that he was dealing with topics that were really apart from the business of the Conference, and to some extent he had been, but he wanted to outline what he had in his mind in order that they would appreciate the sincerity of the Government in approaching that question.

Condition of the Dairying Industry.

It had been brought to the recognition of the Government lately that the dairying industry was not in a satisfactory condition. There were many factors contributing to the present deplorable situation, not the least important of those factors being fluctuation in market prices. Most of the factors that operated now adversely against the dairymen in this State could be overcome by intelligent consideration of the difficulties, and by the formation of a definite policy, and adherence to that policy by the farmers and by the Government. The industry itself must be stabilised. Prices, at any rate, must be stabilised; and he agreed heartily with what His Excellency said about the necessity of assuring to the producers in the agricultural industry a fair remuneration for their toil. (Hear, hear!) Every man at least was entitled to that. No man, at any rate, who had been, as he had been, largely interested in stabilising the conditions of industrial workers could contend against the most essential and indispensable worker in the community having his remuneration stabilised. (Hear, hear!) It was not outside the bounds of possibility for the dairyman, in conjunction with the Government, to bring about conditions that would lead to the stabilisation of prices in their industry. He did not say that could be got by the mere granting of a Government subsidy or anything of that kind. They had to look deeper; first of all for the cause, and then provide something more sound than any kind of spoon-feeding. (Hear, hear!) The solution was easily attainable. There had been a good deal of talk during the last few months—in fact some farmers' journals had ably advocated it during the last year or so, and they were entitled to due credit for the propaganda they had carried on in that connection—they had been advocating the establishment of what was more or less loosely known as an advisory board for the dairying industry. In that direction there was to be found a solution of many of the difficulties.

No Cut-and-Dried Plan.

The Government could not present to the Conference a cut-and-dried plan to solve all the problems and cure all the evils with which they were confronted. It would be useless their attempting that kind of thing, but he thought the

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Conference itself could arrive at the decision to investigate many of the problems, and, by careful, patient, and business-like investigations, formulate a scheme to overcome those difficulties. It was, of course, putting the onus of the solution upon the industry itself—upon the men in the industry—but those in the industry would not complain of that. The delegates present and those whom they represented would not complain if the responsibility was placed on their shoulders of formulating a policy. He did not think anyone could complain so long as that opportunity was given to them and so long as they were assured, when the policy was formulated, that the authorities would do their part in carrying it out. (Hear, hear!)

A Tangible, Attainable Policy.

That was what Mr. Gillies and he had to offer them that day—the invitation to formulate a tangible, attainable policy, and the Government would assist them to carry it out. (Hear, hear!) There had been circulated amongst them a series of resolutions referring to the establishment of an advisory board. That was a practical step, and it was necessary, because there was no royal road to the solution of those problems. No matter how wise a man might be he could not stand there and formulate a proposal which was practical to adopt and which would solve all their difficulties. The problems were so complex, because so deep-rooted, that they wanted an advisory board of experienced men interested in the business thoroughly to consider the matter, sitting, if necessary, frequently and over a long period to formulate a policy for the Government, the Department, or the organisations of farmers and co-operative companies to put into operation. If they had such an advisory board, then they could arrive at some policy that could be applied. There had been a question of the formation of a pool. There was a diversity of opinion as to whether a Queensland pool would be effective. There was a lot of difference of opinion even as to whether an Australian pool would be effective. He did not pretend to be able to say whether a pool was the solution of any of the present marketing difficulties. That was why he wanted an advisory board. Let the advisory board consider that question together with all the other suggestions that might be made to such a board.

Better Co-ordination of Co-operative Companies.

There was the question of better co-ordination of the efforts of the various co-operative companies that were now established; the wisdom of amalgamating all those companies. Those were matters that the board, so long as the industry had full confidence in the board, could consider and formulate a policy upon. His own opinion was that they would never get the full beneficial effect of co-operation if it was carried on sporadically; if they had a co-operative company dealing with 20, 50, or 100 suppliers in one district acting independently of another co-operative company in the next district or some other co-operative company somewhere else, each dealing separately with the agents or exporters or shippers, and all of them working more or less uneconomically—on account of the smallness of their individual operations and the high administrative costs. They could not get a true solution of the marketing difficulties while co-operation was carried on in that loose way. They would have to go in for wholesale co-operation, and they had had experience of it in the kind of co-operation carried on during the war under the ægis of the Federal Government. Take the example when the whole of the wheat of Australia was managed co-operatively in the marketing of it when 100 or more exporting firms and operators were cut out and the thing

managed by the farmers through their own central board. They had an illustration of what could be done on the lines of extensive co-operation in the wheat pool which was carried on in Queensland.

A Delegate: A very good thing, too.

The Wheat Board.

The Premier: An excellent thing, too. Now, the Wheat Board started under somewhat disadvantageous conditions. It was hurriedly organised. It came late into the field. It was dealing with farmers who never before had dealt with co-operative effort of that kind, and they must admit—one must admit it candidly—that it made a great success of the business. (Hear, hear!) There was a Wheat Board consisting of five farmers, elected by the farmers themselves, and a chairman. They appointed their staff, settled their own policy, organised the necessary machinery, bought oversea freights, arranged charters, made agreements with the millers, and handled the whole business which was previously handled by large operators in Brisbane and elsewhere, and they managed it successfully. It was the largest wheat crop ever handled in Queensland, and the cost of handling that wheat crop by the farmers themselves was less per bushel than the cost by private enterprise in the previous years. Not only that, but the whole of the profit made in the handling of the wheat—the whole of the saving through more economical management—was returned to the farmers themselves. (Hear, hear!) This was done though they started out with practically no capital in the ordinary sense. It might be said they could not have colossal schemes of co-operation unless they had colossal funds to carry them through. The Wheat Board started without capital in the real sense of the term. Of course, they were able to capitalise the resources of the farmers supplying the wheat and they had a guarantee from the Government, but no actual cash. They started out with nothing, and in one year they carried out transactions aggregating more than £1,000,000. He did not say it would be as simple to accomplish the same result in connection with dairy produce or agricultural produce of other descriptions; but what had been done there and what had been done in the South during the war with large wheat pools, wool pools, metal pools, and other gigantic undertakings managed on behalf of the producers —what was done there in the elimination of large operators, traders, shippers, and exporters—the large body of men who come between the producers and the consumers—could be done in the dairying industry in Queensland. (Hear, hear!)

"Go Ahead."

If it was necessary—and, in his opinion it was necessary, but whether it was practicable was a different matter—to have co-operation to some extent in connection with dairying, so as to practically embrace the whole of the cheese, butter, and milk products, he would say "Go ahead." They had the resources, and they could accomplish it. The product was worth millions. The Secretary for Agriculture had referred to the year 1920. The value of dairy products in Queensland alone was estimated at £7,250,000 in 1920, and nearly £7,500,000 in 1921. That was the value of the products, but many of the operations connected with the marketing of those products were left in the hands of private speculators, traders, and exporters whose resources were limited to a few thousand pounds. The farmers, as a body, had to defer to the conditions laid down by a man or a company who had, perhaps, a capital of £100,000, while they themselves had millions of pounds of capital; they raised products worth—for consumption and export—£7,000,000 or £8,000,000. Why should the policy of the farmers be

dictated by a man who went into the business with a capital of, say, £10,000? They could entirely replace all kinds of agents and merchants and exporters, and even operators in London, if they would intelligently organise and work on a sufficiently large scale in Australia. (Hear, hear!) The general manager of the Coastal Farmers' Co-operative Society, Limited (Mr. C. E. D. Meares), dealing with the British butter market and its probable effect upon the Australian industry, said—

> "Co-operative men returning from London emphatically endorse the impression current over Australia in December-January last, that strong co-ordinated pressure from speculative agents was deliberately exercised to force values down. These tactics, used simultaneously with the inexperienced, misguided handling of the huge Imperial stocks, caused the breakdown of the London market during the period quoted."

The "bearing" operations of a few speculators in London broke down the overseas market, and literally resulted in millions of money being lost to Australian producers. Should they not be organised to protect themselves from those operations? (A Voice: Rather!) He believed they could be. He did not agree with the man who said the selling of butter was so complex and intricate a business that it could only be done by those who were well trained in London by private enterprise. He believed that the farmers' organisations here, employing proper experts, highly paid, if necessary, could manage their own business in London just as efficiently as anyone else. He did not say that they could dominate the London market. The percentage of sales over there might not be sufficiently high to enable them to do that, but they could protect themselves from speculative operations, such as Mr. Meares referred to. If the farmers would utilise the brains at their disposal and organise themselves, and employ experts, they would overcome many of these difficulties.

A Concrete Proposal.

The concrete proposals which the Chairman had to submit, which might perhaps be taken as early as possible, was the proposal for the formation of an advisory board. He strongly urged it himself. There was nothing to stand in the way of its appointment. It would be a costly thing to inaugurate, because, in getting the information required in establishing business and in formulating the policy, it would be necessary to employ the best brains they could get, and they would have to pay money to get those brains, but for the first twelve months the Government were prepared to defray the cost of it. (Hear, hear!) The scheme could be carried out. If it proved to be successful the farmers would subsequently have to take the responsibility of financing it in any modified form they liked. He would like to have an opportunity later on during the Conference to briefly outline a practical scheme of organisation of the farmers, which if the farmers endorsed could be put into operation. He would like to consult them about that, because the success of the scheme depended very largely on the men in the dairying industry. At the present time, they should speak freely and openly on matters they had to discuss. It did not matter whether they confined themselves to the suggestion for an advisory board or not; if they had grievances or difficulties in connection with the dairying industry, they could, of course, give voice to them. They would find the Government sympathetic, and willing, if possible, to assist them. (Hear, hear!) If they thought the scheme could be improved upon they should not hesitate to make suggestions, because the Government had called the Conference together, not to foist upon the farmers a cut-and-dried plan, but to consult them as to the best means of solving many of their difficulties. (Hear, hear!)

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A Frank and Free Discussion.

The CHAIRMAN: A series of motions had been circulated, and it was for the meeting to say whether those motions should be moved in their present form, or in some amended form, or whether they wished to move other motions. If there was no opposition, he would suggest that, while they wanted every one to speak frankly and not to curtail discussion, in order to get through the tremendous amount of business before them, the speeches of the mover and seconder of a motion be limited to ten minutes, and that of any other speaker to five minutes, with a right of reply by the mover for ten minutes, with any extension that the meeting may be inclined to give to any speaker.

ADVISORY BOARD.

Mr. H. McANALLY (Jimbour) moved—

> That an advisory board for the dairying industry of Queensland be appointed by this Conference; such board to have a provisional tenure of office not exceeding one year pending the constitution of a general council of agriculture, district councils, and local producers' associations.

He believed that an advisory board was the one thing they required to put their industry on a better footing than it had been hitherto. As representing the "Producers' Review," he had made an extensive tour of the Burnett district, both in the South Burnett and along the western line as far as Dulacca, and also in the Central Downs, and had got the collective and individual opinion of large masses of producers. He found that there was a great need for reform in the conditions under which they were working, and the producers welcomed the promise of help from the Government. They must have better methods of production, manufacture, and transit, and also better methods of marketing and distribution. The main point which the producer was concerned about was the marketing of produce. The farmer could always expend plenty of energy at the producing end; but it was futile to ask men to buy a 60-guinea bull, if they were only to get 7d. or 8d. a lb. for their butter. A man was not concerned as to what channels these reforms came through provided he got them. The farmer was one of the most progressive of men. They believed that if the selling end was put on a sound basis, the farmer would not be wanting in making progress; it was at the selling end that they lost the grip, and it was there that they needed the cultivated man. They needed the advisory board here. They wanted a committee of business men, with a thoroughly trained manager and staff, in the interests of the dairymen. He referred to the fact that he happened to be a member of the Wheat Board last year. The Wheat Board was purely and simply an advisory committee. The Premier had told them that they started with nothing, and that was a truism. They had to borrow money to carry on until the negotiations with the Commonwealth Bank were brought to finality. So there need be no fear about bringing the advisory board into being and financing it forthwith. If they had an advisory board they would find themselves on a different plane to what they had been on hitherto.

The Road to Complete Co-operation.

As those present knew, they had travelled a long way on the road leading to co-operation. They still had a good deal to learn, and those who had learned should put it into operation. If they had an advisory board, then, no matter whether they were suppliers, directors, or anything else they would have nothing

to do with questions of finance, and they would not have to worry about where the money was coming from. If they took notice of the collapse of the butter market they would see that it was caused by the accumulation of the stocks of butter which were allowed to take place in the old country. If they had had an advisory board that accumulation of butter stocks need not have taken place. The same thing happened in connection with the wool market. There were 2,000,000 bales of wool stored up, including 900,000 bales held in Australia. They could see what the result would be if they allowed the whole of that wool to go on to the market. It would demoralise it. He grew a little wool himself, and he could give his own experience as to the value of having an advisory board in wool. At first he was offered 2s. 0¼d. for his fleece wool, and one year later he was offered 5d. per lb. for the same class of wool off the same sheep. "Bawra" was then formed, and he came under the regulations of "Bawra." By means of scientific selling, which simply meant putting the wool on the market as the market could absorb it, he got 1s. 4½d. and 1s. 5¾d. for the wool he was previously offered 5d. for. If they had an advisory board they could deal with their accumulation of stocks in dairy products in the same way. They could adopt scientific selling in the same way as "Bawra" had adopted it for wool. They had four avenues of production in Queensland—wheat, wool, butter, and meat. They knew where they were with regard to wheat and wool, but they did not know where they were so far as butter and meat were concerned. If they had a board they could apply their energies to dealing with the accumulation of stocks. He had much pleasure in moving the motion.

A VOICE: You cannot apply wool conditions to perishable articles.

Mr. MCANALLY said he was quite aware of that. He did not say that they could keep butter for two years in cold storage and then put it on the market in as good condition as when it was first stored. Each industry must be controlled by its own conditions.

The London Market.

Mr. E. W. WITTON (Chairman of the South Burnett Co-operative Coy.) seconded the motion. It gave him great pleasure to support the motion in favour of the establishment of an advisory board. A meeting of dissatisfied dairymen had recently been held at Murgon, and amongst other resolutions was one in favour of the establishment of an advisory board. The dairymen at that meeting also carried a resolution, which read—

> "That our delegates to the Premier's Conference be instructed to embrace any opportunity of furthering the interests of our industry."

The meeting also carried a resolution which read as follows: —

> "That a conference of co-operative directors and delegates appointed by suppliers be called for the purpose of bringing into being a co-operative advisory board."

That resolution was passed six weeks ago, so it showed that the dairymen were in favour of the board being brought into existence. His experience, and the experience of others engaged in the dairying industry, was that they could deal fairly well with the production part of the business, but directly the butter left their control to a certain extent it was forgotten, and when it hit London it arrived in a most friendless condition. (Laughter.) If the Government could give them some assistance by oversight of the butter when it reached London they would be doing the dairymen a great service. He was not a party political

man, as he was a farmer, but he hoped that Mr. Fihelly would devote the ability which he possessed to taking charge of the butter when it arrived in London in a friendless condition. (Applause.)

Mr. H. M. STEVENS (*Rosewood*): It was ridiculous for Mr. Witton to talk about the butter arriving in London in a friendless condition when they all knew that they had in London an organisation of the whole of the co-operating and marketing agencies of Australia, New Zealand, and South Africa competent and willing to look after all their business if they would only entrust it to them. (Hear, hear!) That organisation in London had been hounded down by speculative operators in London, and Australia also. There was an article in the "Sydney Mail" of 28th February attacking the federation and quoting figures in order to damn it and trying to induce the farmers to withdraw their support from it. Unfortunately, the dairymen and co-operative companies in Queensland and Australia aided and abetted the speculators by handing over their produce to them to manipulate and control the market in any way they liked. The federation were absolutely competent to control all the business, and it seemed lamentable to him to hear a chairman of a co-operative company coming there and invoking the aid of Government assistance. He was glad to hear that the Government were sympathetic to the farmers. They were asked to let bygones be bygones, but it was absolutely impossible for them to forget the treatment they as producers received from the Government of Queensland in years past. They well recollected that one of the first acts of the Government was to arbitrarily fix the price of butter without any reference to the cost of production at all. At that time it was costing 3s. 6d. to manufacture 1 lb. of butter, but the price was fixed by the Government at something less than one-half that price.

Mr. McANALLY pointed out that Mr. Stevens was out of order. They had come there to listen to reasons for appointing an advisory board, and Mr. Stevens was not discussing the question.

The CHAIRMAN: He should discuss the question broadly.

The PREMIER: It seems to me that, whatever happened in the past and whatever mistakes were made, we should find some way of using our intelligence to arrive at a better system now. (Hear, hear!)

Control of Marketing Operations.

Mr. H. M. STEVENS: He congratulated the Government on the fact that they came to the conclusion that the producers were worthy of some consideration and that the Government were not going to insist on making them squeal. (Hear, hear!) The Premier referred to the necessity of financing the advisory board, and magnanimously offered to finance the board for the first twelve months. Already the Government had deprived them of ten times the amount of money necessary to finance any advisory board for very much longer than twelve months, so that if the Government were inclined to make any restitution it would be a mere act of justice only. He was very pleased to hear the Premier's remarks to the effect that capital was not necessary for the farmers to conduct their own marketing operations. That was a bugbear that they found brought up on every possible occasion by the speculators and those who wished to continue to have control of their marketing operations. They were constantly told that it was impossible for them to market their own products while they (the large operators) had ample funds at their disposal. He had maintained for years past that if they would only unite—if considered advisable, have an advisory board—they had the remedy in their own hands. They had the produce. As the

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Premier had remarked, the dairying industry was worth £7,000,000, and with that money what need had they to go cap in hand to the London speculators, the London merchants, or to anyone else? They had their organisations already established, and all they had to do was to hand their produce over to them instead of handing it over to the speculators. They had the matter fixed so far as marketing in the old country was concerned, and he was pleased to know that Mr. Trehearn had gone to the old country in order to link up the Canadian and United States farmers with their organisations, so that they would have a continuity of supplies throughout the year on their own floor space. (Hear, hear!)

Mr. WIGHT (Farmers' Alliance): While he quite agreed with the object of the resolution, he thought it would be inadvisable for the Conference to appoint the members of the advisory board. He would therefore move as an amendment that the words "by this Conference" be deleted, and later on he intended to move an amendment to paragraph (6)—"Constitution of the board"—to provide that it was absolutely necessary that some alteration should be made in the system of marketing their butter in London to-day. They were told that the Wholesale Co-operative Federation met the requirements of the producers; but even the representatives on the various boards of directors could give them no assurance that their butter was now being marketed direct to the retailers through that federation. It seemed to him, from the information available, that the Co-operative Federation was simply another link in the long chain of middlemen that stood between the producer and the consumer. The boards of directors of the different dairy companies had no direct control over the operations of the federation, although they had it indirectly through their local distributing office. He would point out that the agenda paper made no provision for immediate relief of the conditions under which the farmers were suffering to-day, and he had certain proposals to make which he would like to outline. He put them forward on behalf of the Farmers' Alliance. They were:—

"1. That the Queensland Government introduce legislation at the earliest possible moment for the formation of a butter pool (compulsory).

"2. That an advisory board be elected and constituted as follows:—

(*a*) Three members to be elected from the dairy companies' associations;

(*b*) Two members to be drawn from the rank and file of the cream suppliers, nominations for which will be called and selection made by the Government;

(*c*) Two Government representatives;

making a total of seven members.

"3. That all butter produced in Queensland shall be controlled by the advisory board with a view to stabilising prices, and, if the Constitution permits, provision shall be made to prevent imports from other States cutting the local price.

"4. The wholesale selling price shall be based upon production cost, and, until accurate figures are available, 1s. 7d. shall be regarded as the cost to the cream-suppliers of producing the quantity of cream necessary to manufacture 1 lb. of butter.

"5. That the Government establish a distributing floor in London for the marketing of Queensland dairy produce, the floor to be controlled by the producers under the supervision of the Queensland Agent-General's Department."

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He understood that it would be possible to make a provision to prevent butter from the other States cutting under local prices by a Proclamation under the Sugar Acquisition Act. In 1915 a Proclamation was issued commandeering cattle within the State, and by a Proclamation butter also could be made a commodity to which that Act would apply. The farmers to-day were looking to Heaven for some speedy redress. If an advisory board were appointed it would be some considerable time before it could be put in working order and in a position to remove the grievances in the industry which called for immediate relief. They could not wait three months for relief, and by the time the advisory board could deal with the matter some of the farmers would be amongst the ranks of the unemployed. He wanted to obviate that. There was no doubt that the older farms, owing to the construction of railways, were more valuable now. The value had increased 1,000 per cent. in some cases so far as the land value was concerned. He knew of many farmers who bought land in Queensland at £1 an acre 25 years ago who had sold out at £25 an acre.

The CHAIRMAN intimated that Mr. Wight had exhausted his time.

Mr. WIGHT: There was one point he wished to make clear. It would be very unwise for the Conference to appoint the board to-day. It should be left to the organisations in the dairying industry to appoint their own delegates, otherwise they would probably not get intelligent representatives. (Laughter.)

As there was no seconder of the amendment, the amendment lapsed.

Mr. RUDD (Terror's Creek Co-operative Dairy Coy.): As the Premier had stated, the dairymen were a community without any status to-day. The Government and previous Governments were responsible for that position to a very large extent. He took it that a man's status was summed up by the amount of money he had in his pockets or in his banking account. That being so, he would suggest that there was an easy way to put them in the position where they would have some status in the community, when they would not be looked upon by their city cousins as serfs of the community any longer. He was not finding any fault with the Government. They all blundered at times. But if in 1919, through the Price Fixing Commissioner, the Government took money from the industry, the least the Government could do to relieve the distress in the industry to-day was to subsidise the output. That was the only immediate relief that was possible. He could safely say that, in his own district, the people wanted to give up the cows and become factory employees, as they could not pay their ration accounts with the present price of cream. If the Government were sincere they should give relief for the next six months by subsidising the output by 1d. per lb. If that were not done, returned soldiers and others in his district could not hold out any longer, as their credit with the local storekeepers was exhausted, and there would be nothing for them but to leave the land. That would be a national calamity. If the Government agreed to such a subsidy they would not be giving the dairymen any "sop"; they would only be giving back something that was taken from them.

As regards the advisory board: He would like to have seen such a board selected by the co-operative butter factory associations. The Premier said it was necessary to have brainy business men on the board, but they must also have men possessed of co-operative principles. It was no use getting brainy business men who were not in favour of co-operation. He was sorry to read that the chairman of one co-operative factory in Queensland had advocated selling their surplus to speculators. They did not want a man like that on the board. They must be careful in selecting the advisory board, otherwise they would be doing the worst possible thing. Any man who advocated selling their

produce to speculators was an enemy to the co-operative movement, and they should be careful to see they were going to build up their business and not break it down.

Mr. N. C. HOPPER (Cooranga North Co-operative Cheese Coy.) moved the following amendment:—

> "That an advisory board for the dairying industry of Queensland and its objects be considered by this Conference, and that, if decided on, it be elected by the whole of the shareholders of the butter and cheese companies in Queensland."

If the motion was carried in its present form it would tie the Conference down to selecting a body of men who, if they had time to think, they would probably leave out in the near future. It was only right to the dairymen of Queensland that the matter should be referred to every shareholder in the butter and cheese factories in the State. They should get the best brains obtainable.

Mr. CARMODY (Gin Gin District Dairymen's Association) said he had much pleasure in seconding the amendment, as he was of opinion that the dairymen collectively were not truly represented in the Conference. His district strongly supported the appointment of an advisory board, but they needed to be very careful in its constitution. He thought the Government were very lenient in asking only for two representatives on the board, to which he thought they were justly entitled; but being the most democratic country in the world they should consult the suppliers as to who should be their representatives on the board. He welcomed the chance given to them to-day to do something concrete. He said he strongly resented some remarks made before the Price Fixing Commissioner by one lady, who stated that the dairymen out in the country were killing and starving the young life in the city by asking an extortionate price for their milk and butter. He was a worker, and he had never worked harder in his life than he did to-day. There were hundreds of women in the country to-day, who, even on the eve of maternity, were milking cows in all sorts of weather, in order to try and make ends meet. On behalf of his district he would give the advisory board his hearty support.

The PREMIER: It was in the hands of the Conference as to whether they constituted an advisory board and appointed it forthwith from the Conference, or arranged for the election of the board by all suppliers in Queensland. It was quite immaterial to the Government which course was adopted. It would be more democratic to consult every supplier in regard to the constitution of the board. There was only the question of the delay which was involved, which seemed to him to be rather material. The Government desired the advisory board to be appointed, so that it could get to work straightaway. They could not ask the Government to put any plan into operation until the advisory board had formulated a policy. That was why the Government wanted the board appointed quickly, but if the Conference thought that it would get a more satisfactory board by deferring the election it could decide accordingly. (Hear, hear!)

Mr. G. GRAHAM (Esk Co-operative Factory) referred to the scheme suggested by the Commonwealth Minister, Mr. Massy Greene, in regard to which the suppliers in his district were unanimously agreeable, and he took it that the advisory board now suggested was as near as they could get to Mr. Massy Greene's scheme for the present. There would, therefore, be no necessity for him to go back to the suppliers for their approval. As they were there with the confidence of their suppliers, and most of the directors there were

suppliers, it would be a waste of time to refer the matter back to them. That was why he was against the amendment. It would be a pity not to establish some scheme, but he did not think it would be possible to get a good advisory board unless they went in for true co-operation. If they got the cream and cheese suppliers, there was no need to go outside for an advisory board, because they were the most capable men in the industry. The farmers were afraid of legislation, because they did not know where it was going to land them. It had been said that the farmers worked 16 hours a day, and they wanted to get that altered. The farmers did not work 16 hours a day when they deducted the meal hours and time for "smoko." Every farmer knew what work was. He did not go in for farming for the fun of the thing, but he wanted to make his industry pay. At present, he knew of farmers who had their sons working at other occupations near their fathers' farms, and the son was getting more than the farm was returning. In addition, the son had an eight-hour day. He had been dairying for years and used milking machines, and he could not make his dairy pay at the present time. They were not sticking to dairying to get only 8½d. They knew that the markets would fluctuate and they would get more in time, but they could not make their sons see that. They wanted to work for a big co-operative system so that they could finance the industry for themselves.

Mr. W. T. HARRIS (Queensland Co-operative Butter Manufacturers' Association) agreed with the Chairman that they should let the dead past bury its dead. The Government may have hit them, but they had also hit the Government hard in years gone by. It was only a question of hitting a man hard enough to knock him out. If they hit him in a vital part they would get him in the end, and he thought that that was what they did to the Government. They had got a knockout. They were now in a position to start afresh. He suggested that a vote be taken on the amendment.

The CHAIRMAN asked if they were satisfied that sufficient time had been given to the discussion of the amendment, and received an answer in the affirmative.

The amendment was then put and declared lost, only five or six voting in favour of it and the others against.

Mr. J. A. AUSTIN (President of the Queensland Farmers' Union) congratulated the Premier on calling the Conference, as much good would result from their deliberations. The dairymen were seized with the gravity of the situation at the present time, and for some years past they knew the difficulties they had to contend with. Now, at the psychological moment, the Premier realised that there should be a reclamation and a reconsideration of the whole position. As a result of the Conference they should be able to bring the dairying industry to the position it should have occupied long ago. They should make it one of the most profitable industries in the State. In the past the various dairy companies' associations had been the advisory boards for the dairy producers, because they were their elected representatives, and as they were in touch with the various suppliers they were able to know their ideas and were able to advise them. Whatever mistakes had been made in the past they did not want any conflict to-day. He was not *persona grata* with many of the dairy companies to-day, but that did not prevent him from making a fresh start. In the past they had been the victims of circumstances and they were bound by the conditions which existed at the time. With an advisory board they could make a fresh start, and, although errors might occur at the start, it would be for the benefit of the dairymen in the long run. The dairy industry should move forward on the path of progress, and whenever they had an opportunity

of helping it along they should seize that opportunity and do all they could to assist it. He was glad the Premier invited the primary producers to meet in conference. From the men gathered there that morning, he was sure they could elect a suitable advisory board to control the industry. He had much pleasure in supporting the proposal to form an advisory board.

Mr. W. PURCELL (Downs Co-operative Dairy Company, Limited) said he had much pleasure in supporting the motion. He was thoroughly in accord with the suggestion that the advisory board should be elected by the meeting assembled that day. The Premier wisely suggested that the Conference should assemble as early as possible, and that was why they assembled at short notice. As they had a representative gathering, they could elect the board. If they left it to the shareholders they would not get a better board than they could elect themselves that day. The men who were elected to the various boards were well represented that day. They were not elected on their local boards because they were the worst men, but rather because they were the best men in the district, and for that reason he thought they should elect the board that day. He had been president of the Cheese Manufactories' Association for five years, and he appealed to the cheese factory representatives, and also to the butter men, to carry the proposed scheme as it was submitted. They could improve it later on if necessary. They could not go on as they were. They were up against it. Someone said they had not a "bob." He for one gave his last cheque to the "kids." God knows they had to do something. The Government had been good enough to suggest something that would be of benefit to the industry, and they should look at it like broadminded, sensible men, jump at it and hold on to it with both hands. (Hear, hear!)

Mr. SKERMAN (Kaimkillenbun Co-operative Cheese Factory): He had great pleasure, on behalf of the company he represented, in supporting a motion that definite action be taken in regard to the supervision of the industry. It was apparent to all, by the speeches that had been delivered, that they were in a forlorn condition, and something must be done to save the industry and save the country. If the dairying industry was to be carried on as at the present time, the country must become poorer. There would be no extension in settlement, and those people already settled on the land would not be able to retain their holdings. Something must be done to give an impetus to settlement by providing for a reasonable return for primary products. It had been suggested that an advisory board be appointed provisionally for twelve months. During that time it could be knocked into the shape required. He was a son of a pioneer and had worked continuously on the land, and to-day he had to work, and his experience was the experience of many others. One factor that militated against success on the farm was the transport of their cream from the dairy to the factory. They talked about marketing their produce, but in many cases they had a product that was not worth marketing. The condition of that product was brought about, not through any fault of the factories or through any fault of the dairyman, but through not being able to get the cream from the separator to the factory within a reasonable time. A great quantity of the cream in Queensland had to stand from four to seven days from the time it left the separator until it was manufactured into butter. Under those conditions how was it possible to make a first-class butter in a climate like that in Queensland that would compare with Danish butter? The railway system wanted improving vastly if they wanted to improve the condition of their product. They should be able to get their cream to the factory quicker. In 90 per cent. of cases when the cream left the farm it was first quality, but it was second and even third quality when the factory manager had to handle it. Therefore, he would exhort

the Government to try and bring about improved means of transit, as at the present time the settlers in the outlying districts lost 25 per cent. of their income.

Mr. WINNETT (Southern Queensland Co-operative Dairy Company): He moved as an amendment—

> "That an advisory board for the dairying industry of Queensland be elected, and that such board be elected by the directors of existing co-operative companies."

That would meet the bill, otherwise there would be much discontent amongst the factories. The factories should have a chance of electing the representatives, and a time limit could be fixed so that if any factory did not send its vote in by a certain time it would lose its vote.

Mr. SHAILER (Memerambi): They all agreed that it was necessary to have an advisory board, but he did not think the matter should be rushed through that day. If the Board could be elected by the suppliers or factory managers it would be much better, but something should be done immediately to relieve the position. An advisory board would take weeks or months, and in the meantime, unless something was done, a great number of the farmers would have to leave their farms. In his district men—dairymen—had to send their cream in 40 miles to the factory, and then they only got 7d. per lb. for the commercial butter content of the cream. Milk in his district was worth 3¼d. a gallon delivered at the factory for cheese, and under those circumstances it was quite impossible to make a living.

Amendment put and lost.

A Delegate: We do not understand, if an advisory board is appointed, whether it will be compulsory or otherwise.

The PREMIER: There would be nothing compulsory in the scheme, except compulsion on the part of the advisory board to sit and consider the question. They would have to undertake immediately the consideration of the very problems now agitating the minds of those in the industry. If they did their work properly they ought to be able to formulate almost at once some scheme for the Government and those in the industry to act on. What would be done when they formulated their proposals would depend on the nature of the proposals. Suppose they recommended the formation of a pool. Then the industry would have to be consulted.

A Delegate: Suppose one or two factories stand out?

The PREMIER: If the advisory board recommended a pool, before it was enforced the industry would have to be consulted; but if the advisory board recommended a pool and the industry supported the recommendation, then it would be put into operation.

Motion put and carried unanimously amidst applause.

OBJECTS OF THE ADVISORY BOARD.

Mr. W. T. HARRIS, secretary of the Queensland Co-operative Dairy Companies' Association, moved—

"That the objects of the advisory board include the following:—

(*a*) To consider the question of investigating, in conjunction with the Department of Agriculture and Stock, the problems relating to the dairying industry of this State;

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(*b*) To investigate the methods of production, manufacture, marketing, storage, and distribution of dairy produce;

(*c*) To consider the question of the establishment of pools for dairy produce;

(*d*) To consider the question of the co-ordination of the activities of existing co-operative companies;

(*e*) To consider the question of the improvement of the productiveness of the individual dairy herds by general application of systematic herd testing or any other efficacious means.

(*f*) To consider the question of the purchase of all factory and farm requisites through co-operative channels;

(*g*) To consider the question of fodder conservation;

(*h*) To consider the question of extending the benefits of the Co-operative Agricultural Production and Advances to Farmers Act, or any other means for the establishment of rural credit."

A Red Letter Day.

He congratulated the Government on calling them together on that occasion, which was a red-letter day in the history of Queensland dairying. Only a few years ago the whole of their butter was manufactured under proprietary auspices. The farmers then met together and subscribed capital to work the factories. Fully 90 per cent. of the butter in Queensland was manufactured to-day by co-operative companies. He claimed that the dairy farmer of Queensland was the most progressive farmer in Australia. The cheese associations and the co-operative dairying associations had done an immense amount of good not only to the dairymen of Queensland but to the dairy farmers in the other States. He claimed that the dairy farmers of Queensland were the only dairy farmers in Australia to control the price of their product on the local market. In pre-war days the farmers sent their stuff to their agents in Brisbane, who fixed the price, and the farmers had no say in the matter; but to-day the farmers themselves fixed the price of their commodity on the local market without consulting the merchants. That was the progress they had made, and that action had put into the pockets of the farmers in Queensland, in connection with butter sold in Queensland during that period, a sum of £98,000. A few weeks ago, when they found the merchants were giving discounts and attempting to break their markets, the dairymen got together again and laid down the terms upon which the merchants should do their business. They had consolidated their work as they had gone along. What they had done was going to be of lasting benefit to the industry. In Queensland they were taking a forward move to improve the quality of their production. One of the first functions of the proposed advisory board would be to ask the Government to take steps to enable the Railway Department to build a larger number of railway trucks suitable for the carriage of butter. The farmers were endeavouring to improve their article, and the advisory board would ask the Department to help them to keep their product good.

The Marketing Problem.

The question of marketing was a big problem. There was not a butter company in Queensland which was satisfied with the present method of distribution of their products in the markets of the world. He had seen Queensland butter going into store in London in a poultry shop, where they never sold a

pound of butter, and coming out three or four doors away in nice Dorset rolls and Devonshire pats, which showed that if they made a good article it would sell; but they were not selling their butter at the other end in a proper manner. They had sent their butter to the merchants and let them do what they liked with it. As dairy people they objected to the Government going on with the Hamilton Cold Stores, which they thought was a mistake, but the farmers had made a greater mistake in not going on with their own works. As bad as they thought the Hamilton site was, it was better to have a cold store somewhere in which to store their butter, instead of leaving it for four or five days in the railway trucks.

The Premier: The advisory board, if it had been in existence, would have been consulted about the site for the cold stores and such matters as that.

Mr. W. T. HARRIS was glad that the board would be consulted in those matters.

The CHAIRMAN: That is one of their functions. I do not want to stop you, but you have exceeded your time unless the meeting grants you an extension.

[*A motion was formally passed granting Mr. Harris an extension of time to finish his speech.*]

A Dairy Pool.

Mr. W. T. HARRIS: Another object of the board was to consider the question of the establishment of pools for dairy produce. They had been devoting their energies in that direction for some time past, and they had been trying to get the dairy farmers in the other States to come forward and join a Commonwealth pool. In Queensland, they had advocated in season and out of season the formation of a compulsory Commonwealth pool, but they were informed by the Commonwealth authorities that it would be unconstitutional to grant a Commonwealth pool. That being so, it remained for the Queensland dairy farmers to form a Queensland pool. Although he had always been an advocate for a pool, he knew that they had not been the success they at first anticipated.

The CHAIRMAN: Did the Commonwealth Government refuse to grant you a Commonwealth pool?

Mr. W. T. HARRIS: Yes. The Commonwealth authorities refused to grant it on the grounds that it interfered with State rights.

The Premier: They would have as much authority to grant that as to form a Commonwealth Wheat Board.

Mr. W. T. HARRIS: When they made application they were informed by Mr. Massy Greene and Mr. Rodgers—the Ministers concerned—that a Commonwealth pool could not be formed. Although he believed in a voluntary pool for the Queensland primary producers, he thought they should go neck or nothing for a compulsory Commonwealth pool. He thought the lines laid down by the Minister as the objects of the advisory board were all that they could desire. He noticed that the board was to consider the question of the purchase of all factory and farm requisities through co-operative channels. That was a business proposition, and was one which would help the farmers. When the farmers bought individually they had to pay through the neck for everything. He remembered twelve months ago that the timber merchants wanted 3s. 6d. to 4s. each for boxes, but when the co-operative company made the arrangement they were able to get 250,000 boxes at 3s. each, thus effecting a saving for the farmers of something like £6,250. In connection with the purchase of machinery, the

Maryborough factory was able to purchase a boiler for £300 less than if the purchase were made by an individual. It would be an economical proposition for the advisory board to buy all requisities for farmers. He knew, as secretary of the Dairy Companies' Association, that he could purchase cans and separators for 25 per cent. to 30 per cent. less than the market rates ruling at present. He had much pleasure in moving the resolution he had just read.

The Greatest Forward Movement.

Mr. McANALLY expressed his pleasure in seconding the resolution. He was pleased that the meeting decided to elect an advisory board, and he approved of the objects set out in the motion. Their position had been considerably advanced by that Conference, and that day would be a red letter one in the history of the primary producer. They had progressed considerably, in that they were able to induce the head of the Government to come down amongst the farmers and talk to them at first hand on questions which most affected their industrial welfare. (Hear, hear!) It was the greatest forward movement that the farmers of Queensland had been able to make up till the present time. He did not agree with Mr. Harris about the Danish butter, as he considered the Danish butter should be given first preference, but the Australian butter came a good second. (Hear, hear!) The Danish butter, however, was put on the market under one brand, whereas the Australian butter was put on the market under 453 brands. They would have to alter that. All that the producers asked for was fair justice. In the case of wheat, the farmer got his 5s. or 8s. per bushel. The miller passed it on to the baker, and the baker to the consumer, and the consumer in turn got an increase of wages at the Arbitration Court, so that everybody benefited, and everyone got fair justice. They had converted Mr. Gillies to their way of thinking long ago, and now they had converted the Premier. (Laughter.)

The motion was put and carried unanimously.

ADMINISTRATION.

Mr. J. H. KESSELL (Gladstone): The next motion was a formal one He moved—

> "(3) *Administration*: That the advisory board shall be given authority to appoint an administrative staff consisting of a manager, a business expert, and such other skilled investigators as may be considered necessary by the board."

Mr. ANDREWS seconded the motion, and it was agreed to.

LEGISLATION.

Mr. J. A. AUSTIN moved—

> "(4) *Legislation*: That if necessary the advisory board shall be invested with statutory authority, and in such case the board shall advise as to the authority necessary."

Mr. BERMINGHAM seconded the motion, and it was agreed to.

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FINANCE.

Mr. HOPPER moved—

"(5) *Finance*: That during the first twelve (12) months of its existence the cost of the advisory board shall be defrayed by the Government; that thereafter the scheme shall be financed by contributions from individual suppliers in the industry; and that the rate of such contributions and the manner in which they are to be collected shall be determined hereafter."

Mr. RUDD seconded the motion.

A delegate drew attention to the wording of the resolution, which stated that the Government would finance the scheme for twelve months. Would the Government require two representatives on the board after twelve months?

The PREMIER pointed out that after the board was in operation it might be considered advisable to continue the Government representation on the board. The Agricultural Department would be prepared to render any assistance that was necessary even after the expiration of the first twelve months. The usefulness of the advisory board would depend on the men appointed. The Government would act generously to the board, and would continue the financial assistance after the twelve months if necessary. They would, no doubt, desire to have the best business men on the board, and if they got the best brains and the men with the most ability they would have to pay them well. It might cost £5,000 for the first year, but whatever it was the Government would assist them financially. They could consider the question of further assistance at a later date.

Mr. GRAHAM said that the motion stated that contributions would be made by individual suppliers, and he asked what that covered.

The PREMIER: His interpretation was that it might be advisable to levy a small sum like one-eighth of a penny per lb. on butter-fat supplied to butter factories, and one-sixteenth of a penny per gallon on milk supplied to cheese factories. That would be following the same policy as was adopted with the Cane Price Boards. There was a levy upon every ton of cane harvested. That was the fairest kind of contribution they could have, and those who contributed did not feel it, although in the aggregate it provided a very large fund indeed.

A DELEGATE: The motion should read "such contribution from suppliers" instead of from "individual suppliers."

The CHAIRMAN: If there was no objection he would cut out the word "individual."

The motion, as amended, was carried unanimously.

CONSTITUTION OF BOARD.

Mr. HOLTON moved—

"That the provisional Advisory Board shall consist of seven members, of whom five members shall be appointed by this Conference and two members by the Government."

Mr. PENDER said he had much pleasure in seconding the resolution, as it was only proper that the Government should be represented on the board. The Government had in its employ as dairy inspector probably one of the ablest men in Queensland, and that gentleman's advice would be very helpful to the board. Mr. Graham was a very able officer, and his assistance would be very

useful to the board. Many years ago he was present at a conference held in Parliament House when Mr. John White was Minister for Agriculture, and the delegates at that conference unanimously agreed that Mr. Graham should be placed at the head of the department.

The CHAIRMAN: There was no doubt but that Mr. Graham would be one of the Government nominees. I appreciate what you say regarding him.

Mr. JAMES PURCELL: First of all he would like to congratulate the Premier on his very able address. So far as the producers were concerned, it was the most hopeful address given by any Premier in any State in the Commonwealth of Australia. (Hear, hear!) They all congratulated the Premier on his very fine address, and he was very hopeful that some great good for the dairying industry would come out of it. He would like to remind the Conference that there were three great branches in the dairying industry represented at the Conference, and if the Conference were going to vote in a body for those representatives there were some branches of the industry that would be left out. He would ask the Government to agree to have one representative on the board instead of two, and that they give the butter interests three representatives, to be nominated by the people in the industry; that they give the cheese people two representatives, to be elected by the people in the cheese industry; that the Government have one representative, and that they give the condensed milk industry one representative.

The PREMIER: You need not cut down the Government representation—you can increase the number of members on the board.

Mr. JAMES PURCELL: It was very necessary to keep the number down. Each branch of the industry should have representation in accordance with the importance of the branch. He therefore moved—

> "That the board be constituted of seven members, three to be elected by the butter people, two by the cheese people, one by the condensed milk people, and one by the Government."

The CHAIRMAN: I take it that Mr. Purcell intends that this Conference shall proceed with the election?

Mr. J. PURCELL: That is so.

The CHAIRMAN: If that is so the Government are prepared to accept the amendment.

A DELEGATE: In regard to the representative from the condensed milk people—would he represent the proprietary companies or the co-operative companies?

The PREMIER: The representation would really be from the suppliers, because it was a suppliers' problem they were considering, and not the proprietary companies' problem.

The CHAIRMAN: We should lay it down clearly that the representative of the condensed milk people is a supplier.

The PREMIER: If there was any danger of the proprietary companies being represented and thus dominating the board, it might be necessary to state that the member must be drawn from the milk suppliers.

Mr. McANALLY: He did not agree with Mr. Purcell, as his motion seemed to bring in a spirit of antagonism between the two interests. He did not see why they should not allow the motion as originally on the paper to be

passed. In a dry time very many of the cheese factories had to close up altogether, and the suppliers were forced to send their milk to the butter factories. They had met under the co-operative principle, and why could they not all combine?

Mr. BURTON (Wyreema): He thought Mr. Purcell's suggestion was a very wise one, as it would remove any possibility of bias. He was pleased that the matter of a representative being elected to represent the condensers had been brought up. He really represented 150 suppliers to the condensers, and he had no desire to be on the advisory board; but he should like to have someone on it, and he did not think any trouble would be caused in regard to the representative being in proprietary interests, because it would be a supplier who would be on the board, and not a member of the proprietary company. Whilst he was speaking, he would like to thank the Chairman and the Premier on behalf of the suppliers whom he represented for calling the Conference together. He might not have another opportunity of assuring the Chairman and the Premier that the dairying industry was in a very bad way. Those delegates present were mostly men who had made good. Perhaps they had had their properties left to them by their parents; but behind those gentlemen there were a lot of people in the country with ruin absolutely staring them in the face, and he commended very strongly the action of the Government in calling the Conference together.

Mr. MICKAN (Kingaroy): Mr. Purcell had asked for three representatives from the butter industry, and in electing those three representatives they should elect them in such a way that the different sections of Queensland would be represented. In 1918-19 and 1919-20 the output of butter from the various Downs districts represented 17 per cent.; output below the range and South Coast amounted to 29¼ per cent.; and for the North Coast and far North the output represented 53¾ per cent. He thought that that pretty well proved that the representation should be by district.

Mr. WIGHT (representing the Farmers' Alliance): He believed that the success of the advisory board rested in the election of its members. He thought it would be impossible for the meeting to elect the members of the board satisfactorily, because they were unacquainted with one another, and the dairy and butter producers' associations, and the producers themselves, should have an opportunity of saying who should represent them. He wished to move the following amendment—

> "That two members be elected from the dairy companies' association; one member from the cheese companies' association; two members to be drawn from the rank and file of the cream suppliers, nomination for which will be called and selection made by the Government, and two Government representatives, making a total of seven members."

The CHAIRMAN: He could not accept that amendment, because the Conference had already affirmed the principle of the Conference electing the board.

Mr. G. GRAHAM thought that the milk suppliers to the milk factories should be represented. He was speaking for Nestle's at Toogoolawah and the Toogoolawah Dairy Farmers' Association. Up there they paid on the butter fat; it did not matter to the factory where the farmers were getting their milk from. It was not a matter of proprietary companies, but of suppliers

Mr. STAFFORD (Standard Dairy Company) said he did not see why the election of members of the board should be confined to suppliers if a company had been doing a good thing for the country in building up a good business. A supplier or a member of a proprietary company should be eligible.

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Mr. PURCELL moved an addition to his motion—

"That the representatives of the butter, cheese, and condensed milk branches of the industry, respectively, meet separately to elect the members of the provisional Advisory Board referred to in Resolution No. 6."

Amendment agreed to.

Motion, as amended, put and passed.

The CHAIRMAN: The next thing was to arrange to carry out the election.

The PREMIER: They had really agreed on the principle of sectional representation on the Advisory Board, and the particular sections to nominate representatives. He suggested that the representatives of the butter, cheese, and condensed milk industries, respectively, should meet separately to elect representatives of the provisional Advisory Board referred to in resolution 6 on agenda paper.

Mr. J. A. AUSTIN suggested that the election be held at once, and that they should separate for half an hour.

Mr. HOLTON endorsed the suggestion.

The Conference then adjourned until the election of members of the Advisory Board had been disposed of.

The Conference resumed at 4.30 p.m.

The CHAIRMAN announced the result of the voting, and stated that the Advisory Board would be constituted as follows:—

Butter representatives: Messrs. W. T. Harris, T. Flood Plunkett, and W. E. Dean.

Cheese representatives: Messrs. William Purcell and Henry Keefer.

Condensed milk representative: Mr. G. Burton.

The CHAIRMAN said he would like the members of the Advisory Board to meet him after the Conference had concluded, as he had a number of matters to discuss with them. He would provide them with a room at the Agricultural Department, and, if necessary, they would also be provided with a temporary secretary. It was necessary that they should get to business straight away.

GENERAL BUSINESS.

The CHAIRMAN said he did not know if any member had anything further to bring before the Conference. He would like to know if members wished to sit after the tea adjournment, or if they would like to continue their deliberations on the following morning. If they had no further business, he would call on the Premier to address them on the organisation of the agricultural industry generally and the policy of the Government regarding agricultural matters.

Mr. HOPPER said the Premier invited them to bring forward any matters after the business on the agenda paper had been disposed of, and there were one or two small matters of vital importance to the cheese manufacturers which might be ventilated. Speaking of the cheese manufacturers on the other side of Toowoomba, he thought they should be given better facilities for the

marketing of their products. Cheese was sent by rail to Brisbane from Bell and Kaimkillenbun, and in order to see in what condition the cheese was delivered in Brisbane he paid a visit to Foley Bros. He found that the cheese had to be put in dirty railway trucks at both Bell and Kaimkillenbun, and in addition the trucks had bolts protruding 1 in. to 1½ in. from the floor of the trucks. The result was that the marks of the bolts protruded into the cheese, and, in addition, the dirty floors meant a deterioration of the cheese of from 10 to 20 per cent. He hoped the Premier and the Chairman would see that the Railway Department gave this matter serious attention in the interests of the primary producers. He thought it was a matter the Advisory Board should go into as soon as possible. He thought they should approach the Government to provide properly insulated trucks for the cheese manufacturing districts, so that their produce could be marketed in good condition. Anyone looking at the cheese from Toowoomba would see that it arrived in good condition, while that from Bell and Kaimkillenbun was a disgrace. The Dairy Act passed by the Government was one of the very best dairy Acts ever passed in Queensland, but they should not force it on to the primary producers without helping them financially to carry out its provisions. It would be a big burden on the primary producers unless they were given some financial assistance. The Government had State sawmills, and they could help the primary producers in adopting a standard box for all dairies.

The CHAIRMAN pointed out that Mr. Hopper's time had expired.

Mr. J. PURCELL thought that the matters raised by Mr. Hopper could well be left to the Advisory Board, as they were the very matters that the board were appointed to deal with.

The CHAIRMAN said that he had met Mr. Hopper on his farm, and he knew that he was a hard-working primary producer, but he thought his ideas could better be taken up by the Advisory Board. They could make recommendations to the Government, and those recommendations, coming from such an organised body, would receive every consideration from the Government.

Mr. HOPPER accepted the suggestion made by Mr. Purcell, and said he would take the matter up with the Advisory Board.

Mr. KESSELL thought that the delegates would like to hear the remarks of the Premier.

MR. THEODORE'S SCHEME FOR ORGANISING THE AGRICULTURAL INDUSTRY.

The CHAIRMAN: I have much pleasure in calling on the Premier to address you. (Applause.)

The PREMIER, who was received with applause, said he did not want the impression to be created that he wished to monopolise the Conference. But he had one or two ideas to put forward for their consideration. Full opportunity would be given for all their proposals to be brought forward. He hoped the Conference would not be terminated hurriedly before they had a full opportunity of discussing all the matters they had met to consider that day. What he wished to put before them was a scheme for effective organisation, which was the main concern of the agricultural industry. That Conference was the most representative dairy conference that had ever assembled in Queensland. It might not be the largest numerically, but it was the most representative conference of dairymen that had ever assembled. Therefore, he would like to put before them his scheme of organisation, which, in his opinion, was necessary before they could have an adequate solution of the problems with which they were confronted. They had elected an Advisory

Board, but if they did not do anything further than that then they would have no better organisation than they had before. If that was all they were going to do, then the agricultural industry would be no better off than when they started. It was like attempting to build an organisation from the top downwards, instead of from the foundation upwards.

Basic Organisation Necessary.

They had an Advisory Board created, but they had not a basic organisation established. It was necessary to start in that way, because of the urgency of some of the problems, but they should be lacking in wisdom if they did not take the existing opportunity to establish a thoroughly effective organisation among the farmers in order to complete the scheme of which the Advisory Board was only a part. The Advisory Board must dovetail in with a complete scheme of organisation, and the Advisory Board in the dairying industry was, perhaps, not the only Advisory Board that might be necessary in connection with agriculture. He did not suppose they could find any branch of agriculture more disorganised or suffering worse disabilities at the present moment than the fruitgrowing industry of Queensland or of Australia, and if any branch of agriculture wanted an advisory board the fruit industry wanted it in all conscience. That was why he said they should only be doing part of the work if they were content with appointing an Advisory Board and allowed that Advisory Board to study the problems and let the work rest there. Every farmer ought to be organised into some form of farmers' association, the designation of which did not matter, but the form of constitution did matter. The farmers themselves ought to determine that eventually, but in order that the thing could be started, he had roughed out a scheme—just the skeleton of an organisation—in order that such a thing could be launched. It might be asked, "Why establish another organisation when the Queensland Farmers' Union was in existence, and the Farmers' Alliance, and various other organisations of that kind?"

The Wider Aspect of Agriculture.

There was a necessity for an organisation to deal with the wider aspect of agriculture and to co-ordinate the efforts of all farmers' organisations that were not party political organisations, and there was a necessity for an organisation which was broad enough to embrace every agriculturist and small grazier in Queensland, and it was necessary for that to be free of any party alliance whatever. It might be equally necessary at the same time to have, if they liked, Queensland Farmers' Unions and Australian Labour Party organisations in farming districts, or whatever other kind of party organisation they wanted for purely party political purposes. A farmer must have the same right to express his party prejudices or beliefs or preferences as any other member of the community, but it was essential that there should be an organisation free of that kind of limitation; free for everyone in the agricultural industry to participate in; and free to act in full co-operation with the Government, whatever Government might be in office—whether it was the existing Government or some other Government.

The American and Canadian Systems of Rural Organisation.

His ideas upon the matter had to a large extent been assisted by a study of the conditions relating to the organisation of farmers in Canada and in America, and one had to give consideration to the experience of those countries, who had advanced vastly farther in that respect than any other agricultural country in the world. The United States and Canada had through

the organisation of the farmers and development of agriculture increased the status of the farmers farther than any other country in the world, and they in Queensland would be foolish to ignore the experience of the American farmers or overlook the benefits they had gained for themselves through that form of organisation. In America the organisation was known as The American Farm Bureau Federation. In every agricultural centre, large and small, in the United States there was a local farm bureau. It might comprise only twenty members, or it might comprise 1,000 members, each one of them farmers. Those were linked up with what were known as the County Federations. They had their State executives in every State, and they again were linked up with what was known as the Federation of Farm Bureaux, with headquarters at Washington. They employed a tremendous staff, and their revenues came from individual contributions from members all over the United States. They had a membership of 1,500,000 farmers, and their aggregate membership fees represented a very large fund. They employed the best expert agriculturists, educationalists, propagandists, and organisers that were to be got anywhere in the world, and, consequently, they were carrying on the most effective kind of propaganda and organising, and their influence was felt in an exceptional way in America. The organised farmers in America at the present time was the strongest organised section in America, and their influence was felt in every direction—in public movements, in the Legislature, in administrative matters, and they had the actual co-operation of the United States Department of Agriculture. In every large county and in every State they had what were known as the county agents. Those were expert agriculturists selected by the Department of Agriculture, and paid for by the Government, who were acting in constant co-operation with the farmers' organisation.

A Scheme for Queensland.

That organisation, which had been developed in the last two or three years only, had proved so successful, and had emancipated the farmers from so many wrongs and disabilities, that they would be foolish if they did not attempt some kind of organisation of that nature in Queensland. There was nothing to be lost by it. So section, no party, no authority suffered any loss because of the organisation of the farmers on those lines in Queensland. They were not doing any injury to anybody by doing that, but they were providing the farmers with the means to become articulate—to voice their opinions, their grievances, their wrongs, and by the force of their organisations to have their grievances adjusted, and also to have a basic organisation with which the Advisory Board and other authorities of that kind that might be established would work in complete unity and harmony. The idea he had formulated and which would be circulated was merely the arbitrary outline of a mere skeleton scheme. It did not represent the final word by any means. Nothing of the sort. It was a mere suggestion, and embraced the establishment of what he would call the Queensland Producers' Association. It would comprise local producers' associations in every centre where there was sufficient farmers to form one; those to be linked up in district councils of agriculture. One of the provisions was as follows:—

> "In every district where farmers are enrolled, there shall be formed as auxiliaries to the District Councils of Agriculture and of the Central Council, Local Producers' Associations. Each sub-district may form Local Producers' Associations. (For example:—Assuming that a District Council were formed for the North Coast District, Local Producers' Associations might be constituted at Maleny, Montville, Flaxton, Mapleton, Buderim Mountain, Woombye, and other centres, with, say, the headquarters of the District Council at Nambour.)"

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In the Granite Fruit Belt, in the Stanthorpe District, there were about a dozen fruitgrowing centres. Each centre might have its local producers' association, each one linked up with the district council with headquarters at Stanthorpe. On the Downs, and in the various agricultural districts of Queensland, they could establish all those organisations correlated and co-ordinated and linked up with the Central Council of Agriculture, and the Central Council of Agriculture might be formed in this way. There must be a start somewhere, and this would be a provisional council.

"The first Council of Agriculture might be appointed by the Governor in Council, and should consist of twenty members, such members of the council to be appointed as follows:—

Fifteen members to be elected in groups according to the sections of the industry to be represented;

Five members to be appointed by the Governor in Council;

The Secretary for Agriculture to be president of the council, and other officers of the council to be elected by the council itself.

"This Council of Agriculture is to be the supreme authority in the Queensland Producers' Association.

"The objects of the council shall be to co-operate with the Local Producers' Association and the Department of Agriculture in—

(i.) The development of the rural industries;

(ii.) Investigating and dealing with problems relating to the rural industries;

(iii.) Advising agriculturists with regard to matters which require scientific knowledge and training;

(iv.) Research on subjects pertaining to the rural industries;

(v.) Securing effective action for the controlling of diseases and pests generally;

(vi.) The securing of additional markets for the disposal of produce and of improved means of distribution;

(vii.) The securing of improved means of transport;

(viii.) The watching of markets and the commercial side of the rural industries generally;

(ix.) The general policy of standardising;

(x.) Extending the usefulness of the professional staff of the Department of Agriculture;

(xi.) Regarding matters in relation to agriculture which may be referred to the council by the Minister;

(xii.) Generally, advising, assisting, and co-operating with the Department in all matters pertaining to the rural industries."

The Scheme Explained.

It might be asked how that would work in view of what they have done with an Advisory Board. He might explain that the general council of agriculture would be the supreme authority; but under it, and in close touch with the particular branch of industry with which it was concerned, would be the advisory

boards. The advisory boards would be to some extent subordinate to the general council, but they would be charged with the duty of carrying out special investigations and exercising functions in their special branch of the industry. In these matters they would not be interfered with. Another advisory board could be appointed for the fruitgrowing industry, and the efforts of the advisory boards would, when necessary, be co-ordinated by the central council of agriculture. The whole of those organisations from the bottom to the top, through the local producers' associations, through the district councils, through the advisory boards, and through the central council of agriculture, would be farmer-controlled organisations. The Government would be represented on the advisory boards and on the central council, but it would only be represented by having some of its expert agriculturists on it and the Minister for Agriculture, whoever he might be, from time to time. That was in order to keep complete touch between the farmers' organisations and the department, which must work in hearty co-operation in order to make the best of their advantages. If in order to have the thing launched, the farmers themselves would express their satisfaction with an idea of that kind, the Government was prepared to convene, first of all, the central council of agriculture; to bring it into being the same way as the Advisory Board had been brought into being. He would like to get their assent to the council on those lines. The central council could be a provisional council for the purpose of getting the organisation formed. The provisional council would have to appoint a director and a number of organisers. The Government, in the same way as would be done with the Advisory Board, would finance initial operations for twelve months or so, until the organisation was fully established. When the organisation was established, it would then define its rules, draw up its constitution, determine the mode of control, and arrange its finance, and conduct its business without any interference from the Government or from any other quarter. (Hear, hear!) He would recommend that to their consideration. He would like to have their criticism or comments on it, or to answer any question they liked to ask. This was the scheme he touched upon on his agricultural visit to the Downs and below the range a week or two ago. Since then he had received many communications from various parts of the State endorsing that scheme. In one or two districts they had gone so far as to tentatively elect their organisers to put the scheme into operation. That was a good spirit, and, if that spirit was followed, an organisation of this kind would in twelve months be established.

Farmers a Force.

If they had an organisation of that magnitude effectively established, the farmers would begin to be a force in Queensland, which they were not at the present time. They would be able to speak to Governments, private companies, to the Commissioner for Railways, and the shipping companies, and whoever they had business with, in an authoritative voice. This was the best scheme he could formulate. Of course, the establishment of the organisation itself did not accomplish any reform, but when the organisation was established, it would, by the force of its own power and the brains and energy of the men controlling it, formulate schemes of more effective co-operation for the solution of the problems facing the industry, for the spread of propaganda, for the formulation of policies dealing with educational matters, and so on, and in that way it would effect reforms for agriculture. He was not pretending that the Government was acting as a Government quite impersonally in the matter; the State would get some benefit from an organisation of that kind.

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Building the Nation.

They hoped to make the conditions of agriculture more attractive to those who would become prospective settlers in Queensland. They hoped to get advice from such an organisation to assist them to solve problems relating to administration and settlement—the opening of land to settlement and the carrying on of the Agricultural Department generally. The Agricultural Department would gain immeasurably from the establishment of an effective organisation amongst the farmers, if the farmers would look at it in the spirit in which he was putting it forward. He commended it to their consideration, and invited them to speak plainly and frankly, and hide nothing. He would like to get a confirmation from this Conference, as representative of one branch of agriculture—and, perhaps, the most important branch of agriculture—of the necessity for the formation of an organisation on these lines. As he mentioned at the outset, the form of the organisation did not matter, the name of it did not matter; it was merely a question of getting it launched; it would soon evolve its methods of organisation and constitution without any outside direction. (Applause.)

The Scheme Supported.

Mr. P. K. POWER (Australian Dairy Farmers' Association): He congratulated the Government on the scheme they had put forward. If such a scheme had been established ten years ago, the country would not have been in the position it was in to-day; but these things could never come too late. The organisation he belonged to only started at the beginning of the year, and it was carried out on non-political lines, similar to the scheme which the Premier had outlined to-day. Up to the present, they have been very successful on the Burnett. They had all fallen in with the proposal, which was on non-political lines. He believed that, on non-political lines, there would be no difficulty in launching the scheme proposed by the Premier. The Minister had apologised for having hurriedly called the Conference together, but he (Mr. Power) did not think the honourable gentleman need apologise, because the Conference had come at a critical time, and could not have been delayed any longer, as there were many farmers in a precarious condition. The Minister had touched on the subject of herd testing, and improvement in that direction would make things better in the dairying line, but if they tested the herds and then culled them out, and sold the culls to other dairymen, it would not improve the herds generally. He thought the plan which the Premier had advanced was one which they should all fight for; it was what they had been fighting for in his own district already. For his part he was willing to help the Premier in any way he could in this matter.

Farmers in Sympathy with the Premier's Proposals.

Mr. DOUGLAS (Cooroy) endorsed what the Premier had said. He represented a dairy association, and there were fifty similar associations which had sprung up in Queensland, showing how much the farmers and dairymen were in sympathy with the scheme which the Premier had put forth. It was a question whether it would be wise to sectionalise the farming industry. It might be advisable for dairymen and those connected with subsidiary products of dairying to join together. They would then have a combined interest with which to go before the central council. The fruitgrowers might combine in

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the same way. The programme put forward by the Premier was similar to the policy of his association, which they had enunciated in a leaflet which they had issued. If the different sections of producers were united in their respective interests they would be able to bring weight before the central council in regard to their needs.

Mr. HOLTON: He understood that the scheme outlined by the Premier would at once sweep to one side all existing organisations.

The Premier: No, not to sweep them aside but to absorb them if they are not party organisations.

Mr. HOLTON: He took it that there would be no room for any organisation outside this scheme. The main disability under which the farmer had been labouring, in addition to the want of unity, had been with regard to getting funds to carry on the associations. He hoped the Premier would indicate on what lines the necessary fees to carry on this association successfully would be obtained.

The Question of Sectional Organisation.

The PREMIER: Perhaps he had better answer these queries as they were raised. Two points were raised by the last two speakers—the question of sectional organisation; the organisation of the various branches in compartments, but co-ordinated under the central council of agriculture. That was the intention, although the scheme might not perhaps define it too clearly. It was merely a skeleton, and the provisional council would have to go into the question of drafting a constitution. If the organisation was established, the organisation itself would provide an effective and proper constitution. Anyone could see that they would have a top-heavy, ineffective organisation if they had the men concerned in fruitgrowing, wheatgrowing, dairying, and sugar-growing all combined together on the same board to deal with the details of those respective industries. They would not be interested in the same problems at all. Therefore, the various branches would be segregated for the consideration of their own particular problems, but they would all be linked up with the Council of Agriculture, which would look after the interests of the organisation as a whole. The dairymen must have their own authority controlling their own affairs, and the fruitgrowers likewise. The wheatgrowers would also deal with problems which concerned only themselves. But they would all be linked together in one central council of agriculture, and they would exercise a force as a united body of farmers and could be utilised as required.

Financing Preliminary Organisation.

With regard to financing, he realised the difficulty of launching such an organisation, because of the necessity of having considerable funds at the initial organising period. It was always a difficulty in launching a big organisation to get it going properly, because they might have to spend thousands of pounds before it would be properly established. As it was a semi-public undertaking, and as it was for the benefit of the State, he thought that the State ought to carry the initial cost of establishing the central council of agriculture. A staff would be appointed to direct the organisation. They would appoint organisers in the various districts, the organisers coming from among the farmers themselves. The Government

would pay them for the first twelve months, and after that the central council would devise means for carrying them on. For a time it might be necessary for them to receive Government assistance even after the twelve months. In America they found it wise for the Government to grant financial assistance and pay the entire salaries of the county agents, and they also gave the organisation the use of their expert agriculturists. In fact, they were put under the direction of the organisation. The same thing ought to be done in Queensland. If they had experts in dairying or in stock, and the same with experts in fruitgrowing, experts in dealing with pests and disease, and so on, they could be put in the districts where they could be best used. Their services could be controlled by the district councils formed under this organisation. The American Farm Bureau levied their members to the extent of 50 cents, about 2s., a year. It was not a large sum, but it provided a big fund. It might be necessary to go further than that in Queensland, but they could devise a financial system which would enable their affairs to be carried on successfully. (Applause.)

The CHAIRMAN said that the scheme had been outlined by the Premier for the organisation of the agricultural industry, and printed copies of the scheme had been circulated amongst the members assembled. He suggested that someone might move the general approval of the scheme, as he gathered that they were in favour of it.

Mr. DOUGLAS moved that the remarks of the Premier be endorsed by the meeting, and that his scheme be approved of.

Mr. DEAN seconded the motion.

Mr. J. PURCELL suggested the motion be amended to read—

> "That this Conference approves of the scheme of organisation outlined by the Premier, and is of opinion that necessary action be taken to bring the scheme into operation at once."

Mr. DOUGLAS accepted the amended motion, and in this form it was put to the meeting, and carried unanimously.

APPOINTMENT OF DAIRY REPRESENTATIVES.

The PREMIER suggested that the meeting should appoint the representatives of the dairy industry to the provisional Council of Agriculture. Afterwards the council would become a permanent body. Neither the Minister for Agriculture nor himself could give much personal attention to the details of the organising work, and it was not desirable they should do it. The work should be in the hands of the council quite independent of politicians. The council would have to appoint its own organisers, and pay them a good salary. Those present, as representing one branch of the agricultural industry, could appoint their representatives, and the fruitgrowers and canegrowers could appoint their representatives later on. He suggested that they should appoint their five representatives. The Government would, at a later date, appoint five members to represent the Government on the council. In all probability Mr. Story, Public Service Commissioner, would be one of those representatives. Mr. Story possessed excellent organising ability and had assisted him greatly in

formulating this scheme. He had given great consideration to agricultural education, perhaps more than any other man in the State, and the council would look to him for advice. He suggested that the five representatives be appointed.

Mr. STAFFORD moved—

"That the five dairy representatives be chosen by the Advisory Board appointed that day."

Mr. WINNETT seconded the motion.

Mr. WARREN opposed the motion. He had every confidence in the members of the Advisory Board, but he thought the council should be elected by the farmers themselves. He knew it was difficult to get meetings of farmers, and he quite understood that, as the farmers worked hard and had no time to attend meetings. It was hard for a farmer to make a living out of his farm now, and that was the reason his sons migrated to the cities, where the conditions of employment were better than on a farm. That was bad for the country, and was increasing the population of Brisbane at the expense of the country. If they could only get rid of party politics they would have a much better country, and he would like to see the Premier come out as a non-party politician. (Loud laughter and applause.) He would oppose the motion, and moved as an amendment—

"That the members be appointed from the delegates present."

Mr. PETERSON (Killarney) seconded the amendment.

A Forward Move.

Mr. SLOAN congratulated the Chairman and the Premier on the proposition they had put forward. Dairying and other agricultural pursuits were good for the State and should be fostered. The Premier had taken a forward move in inviting the representatives of the dairy industry to meet to discuss this proposition. The more they could raise the status of the farming industry, educationally and otherwise, the better it would be for their children. They should put party politics on one side and embrace this opportunity. He had gathered from the remarks of the Premier and Chairman that there was a possibility of the party political system being abolished. He hoped to see it abolished and that all would be working for the good of the State. He did not agree with placing in the hands of the six men who had been elected to the Advisory Board the power to elect the grand council. He had been in favour of the election of the Advisory Board, not exactly because he believed in the men on it, but because the dairy industry was in such a critical position that they had to give some opportunity of rendering assistance in the near future. They had, therefore, sunk all differences and elected the Advisory Board. The Premier pointed out the delay which would ensue by referring the matter of the election of the board to their organisations. The various associations might turn round and say that the Conference had no right to elect a central council without reference to the associations, as there was no hurry for it. Let the delegates, therefore, go back and place the matter before their associations to be decided by ballot. If this Advisory Board was going to be truly representative of the dairy industry, they would want loyalty amongst the co-operative factories. They had had a little experience in his district some time ago in illustration of this. They joined a pool and also the co-operative association of Queensland.

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They found that one of the co-operative factories of that association was shipping butter to Townsville and under-selling them. They wrote to the company and also to Mr. Harris, and offered their butter to him at 1½ per cent. less than they were selling it in Townsville, but the offer was refused. It should be understood that they could not turn round and cut each other's throats. None of the farmers wanted to squeeze the consumer. They were out to get a fair value for their products, and to enable the consumer to get a fair wage, so that he could buy butter at a reasonable price. They must fix the price of butter to the consumer in accordance with the cost of production. The practice had been to fix the price to the consumer first, and to leave an inadequate price for the farmer. He had received a wire from his association that he was not to jeopardise or in any way pledge them until they knew the position fully.

Mr. HEMBROW (Roma): One of the previous speakers said that he should go back to his company to explain matters. His own opinion was that the delegates were there representing the shareholders of their companies. He was prepared, on behalf of his company, to take the responsibility of voting on the question before them. It would take a good deal of time for them to go back and consult all the suppliers of each factory and advise them what to do. The suppliers would simply take their advice on the matter if they went back to them, so that it was quite competent for the Conference to elect the members of the council.

Mr. G. GRAHAM said he understood the Premier to say that the six members of the Advisory Board would be subservient to the council.

The PREMIER: He did not use the word subservient: he said in some sense subordinate to the council. He did not mean that they would be under the supervision of the council. The exact nature of their functions and duties would depend upon what the organisation itself evolved. If there was to be a central council of agriculture it was bound to be the supreme authority in the Queensland Producers' Association. Once having set up an Advisory Board to undertake certain functions they must not then interfere with the Advisory Board; but the council would be the superior authority, in the sense that it would control everything, but it would not interfere with members of district councils or of the Advisory Board in the special work allotted to those authorities. Each would have their own functions, but the council would be the highest authority in the association. It was obvious, or it ought to be obvious, that it was impossible to outline a scheme and settle every detail at the commencement. The scheme must grow and the constitution must be evolved as time went on. All they could lay down at the start was the basis on which the scheme could be established. They were now discussing the council of agriculture, which would have important functions, and they could launch the council and organise the district councils and formulate a constitution to work on at the start. While dong that the council would lay down the lines of action which ought to be adopted. When he used the term that the Board was a subordinate body to the council, he thought that in their own sphere they should be the final authority.

Mr. G. GRAHAM: The council will be supreme?

The PREMIER: It will be the executive head.

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Mr. G. Graham: The Council can override the Advisory Board.

The PREMIER: No, not in the matters referred to the Advisory Board for their investigation and decision. The functions of both ought to be defined. The council would be a consultative board on all branches of agriculture, and would consider all problems relating to agriculture. The council would have the right to lay down plans and make recommendations for the agricultural industry as a whole, so in that sense it would be the superior authority; but each Advisory Board would look after its own functions. He was not wedded to any particular form of control. This was a tentative scheme, and he thought it was a workable one, and they could alter it to suit the existing conditions as time went on.

Mr. SLOAN asked if the Advisory Board brought forward any matter which conflicted with the council, which opinion would prevail.

The PREMIER: It was not necessary to attempt to deal with every problem at the start. The council would have to use discretion. Say the fruit-fly trouble was brought forward, the council might decide that that was a matter that could be best dealt with by the Advisory Board for the fruit industry, but they would find out the best way of dealing with these matters as time went on. Other matters might be referred to the Agricultural Department, and matters referred to the Agricultural Department might be sent to the council or the Advisory Board. Common sense would have to be exercised when referring matters to different bodies for investigation and attention. There might be overlapping for a start, but as the scheme evolved they would get over that difficulty.

Mr. SLOAN thought the Advisory Boards would be antagonistic to the council of Agriculture.

The PREMIER: If matters arose which affected more than one branch of the agricultural industry it would be dealt with by the council. The council would have the means for adjusting differences, and in that sense would be the final authority.

Mr. HOLTON pointed out that, according to the Premier's scheme, the council would have the same functions to attend to as the Advisory Board elected that day.

The PREMIER pointed out that those functions were allotted to the Advisory Board that day because the council of agriculture was not yet in existence, nor could the council exercise those functions until the Queensland Producers' Association was firmly established; but as soon as the council became a permanent body they would take over those functions set out in the scheme. The Advisory Board would then deal with particular matters, such as a pool or the co-ordination of co-operative companies. Experience would show them what functions to take from the Advisory Board.

Mr. W. T. HARRIS thought it would mean too much delay to go back to the co-operative companies to elect the five dairy representatives. He thought they should be elected that night.

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Mr. STAFFORD stated that they had already appointed an Advisory Board, and if they appointed five members from the dairymen to act on the council they would be supreme to the Advisory Board. He thought they should appoint five members from the Advisory Board to act as their representatives on the council.

Mr. ANDERSON stated that they appointed the six best men on the Advisory Board, and now they were going to appoint the next best five, who would be supreme over the best six on the Advisory Board.

The PREMIER: It does not matter whether you select the same men or five additional men.

Mr. G. GRAHAM: If the six men appointed to the Advisory Board were elected they would have a jolly sight too much to do, as he understood they would have to do all the organising. There was a chap called "Pooh Bah," and those six men would be in the same position if elected to the council.

The PREMIER: It might be advisable to lay it down that until they had the organisation established, or at any rate formed in such a manner that it would have some effective force, they should not exercise any jurisdiction over the present Advisory Board. The council they were electing was only the council to prepare for the organisation, and not to exercise all those functions that were in the objective. Therefore it might be necessary, in order to prevent any misunderstanding of their powers, that it be provided that they do not exercise any jurisdiction over the Advisory Board until the lapse of a certain time.

Mr. W. T. HARRIS: The Advisory Board which had been elected had special functions in looking after the resolutions passed at the Conference, whereas the central council would have different functions altogether. One of the functions of the council would be to organise the farmers, and the power would be conferred upon them to see that the State was divided into certain divisions wherein district councils and associations could be formed. It was therefore necessary to elect another five men to do that organising.

Mr. SLOAN: He was not objecting to five men being appointed, but he was in favour of Queensland being divided into different divisions, and the agriculturists in those divisions given the opportunity of selecting the best men in the division. If those five men were appointed by the Conference, they would probably comprise men from districts from Maryborough down; and, as the Chairman was well aware, the Atherton District would soon overshadow any other dairying district in Queensland, and the dairymen in North Queensland should therefore have an opportunity of selecting a member of the council.

Mr. PRITCHARD: It would save a good deal of overlapping if they specified that the Advisory Board should work for twelve months until the farmers were properly organised. The council of agriculture could then take the place of the Advisory Board.

Mr. AUSTIN: The Conference had elected an Advisory Board specially to look after the dairying industry, and they were going to be very busy during

the next twelve months. If they carried out thoroughly the responsibilities they had undertaken, they would have their work cut out. They wanted an efficient body of men on the central council—men of organising ability—and they should get the very best men available. The scheme was ripe, and his advice was to let it go on and do not endanger it by an error of tactics.

Mr. GEORGE BURTON (Wyreema): As it was impossible for the Conference to elect members to the council from other industries, would it not be fairer to defer the matter till later on?

The PREMIER: They had there the most representative body for such an election that could be got together.

Mr. HOPPER: He took it that they had elected an Advisory Board to look after the butter and cheese industries. That was the special business they had to centralise on. In addition to that, it was necessary to organise the farming industry generally, and it was quite possible that men capable of looking after the business end of the stick were not capable of looking after the industrial end. The farmers themselves were their worst enemies, and to protect them they must protect them against themselves. They must organise from one end of Queensland to the other. The Advisory Board would be in a more central position, where they could get a better inside knowledge into the marketing problem.

Mr. McDONALD (Central Queensland Dairymen's Company): The position might be cleared up somewhat if they could come to an understanding as to the life of the central council. He took it that it was not the intention of the Premier to bring the central council into being that evening by the mere appointment of five representatives from the dairying industry.

The PREMIER: It would take a month at least to constitute it fully.

Mr. McDONALD: The appointment of an Advisory Board was necessary because of the parlous state of the dairying industry, and it would be most unfortunate if any action by that board had to stand over pending the appointment of a central council.

The PREMIER: That was not involved. The Advisory Board could go straight on with their work. They would not have to wait on the constitution of the central council.

Mr. McDONALD: He would give the Premier and the Minister for Agriculture all the encouragement possible in regard to bringing about the proposed scheme; at the same time it would be disastrous should it happen that the functions of the Advisory Board should be curtailed in any way. If they could appoint a time during which the Advisory Board could act independently of the central council, it would overcome a great deal of the difficulty with which they were faced.

Mr. HOLTON: He would like to take that opportunity of complimenting the Premier and the Secretary for Agriculture on bringing the dairymen together. There had been various meetings of dairymen, but no such representative meeting as the Conference, and he must compliment the Premier on the appointment

of an Advisory Board. Certainly, it was a foregone conclusion, and they could not have appointed better men. The mover of this motion might have been quite right. They had appointed good men, who knew the dairy business from A to Z, and who could easily have selected the five men for the council.

Mr. PURCELL: He would like to ask the Premier whether the central council would have to personally organise the industry. If so, it was necessary to have members of the Advisory Board on the council.

The PREMIER: He was glad the question was asked, as it gave him the opportunity to point out that the council of agriculture would not have to do the organising work personally. It could not be expected, because the council of agriculture consisted of fifteen representatives of the agricultural industry and the five Government representatives. The council would really constitute an executive, and in that capacity they would direct the course of organisation. Under the heading of "District Councils," it was stated—

> "In every district determined upon by the council of agriculture there shall be established a district council. This council shall be constituted by representatives of each of the local producers' associations. The district organisers appointed by the council of agriculture shall be members of the district council for the district in which they are acting."

It implied that the council of agriculture would have a director appointed with the view of getting the thing launched without any delay. They would recollect that he had wired to Mr. Gullett, whose organising capacity was well known, and they would have appointed that gentleman to the position of director if he would have accepted the position. If the scheme he had outlined to the Conference was acceptable to them, it was his intention to leave the appointment of a suitable person to the position of organising director to the council of agriculture. If they could get a man like Mr. Gullett to carry on organisation under their direction, they could appoint him. Let them appoint the district organisers from amongst the farmers themselves, and the work would go on. He did not want the members of the council to go out organising. No doubt they would do a certain amount of propaganda in the district from which they came. They could place the work of organisation in the hands of district officers. He could mention half a dozen men in the room who with himself could organise the work in three months, and the council might do the same thing. He wanted to launch the movement so that the machinery could be established, and the organisation would follow. He was satisfied that the farmers in the various districts would respond. Scores of letters had come into his department and the Department of Agriculture welcoming the proposal for an organisation. The council would organise the staff they employed, and get the most capable man as director for the purpose of keeping the thing going.

The CHAIRMAN put Mr. Warren's amendment—that five members should be elected by the meeting to represent the dairying industry on the council of agriculture—which was carried.

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Mr. MORWOOD moved: "That three men representing the butter industry, and two representing the cheese industry, be elected by the Conference as representatives on the council of agriculture." These men, he thought, would be the men best qualified to sit on the council.

Mr. PRITCHARD seconded the amendment.

Mr. SLOAN: He took it that the six men who were elected to the Advisory Board would receive a salary for their services.

The CHAIRMAN: The Government will pay them.

The PREMIER: The members of the Advisory Board must receive a fee for the time lost while serving on the board. They must receive their travelling allowance and a certain allowance for the time lost. It would be different under the permanent organisation. He did not know whether the permanent organisation, when it was formed, would allow any fees either to the members of the district council or of the council of agriculture. In the first three months members would be called together to consider organising and direct matters, and they should be compensated for their loss of time, and no doubt the Government would provide for that; but the question as to what the permanent policy of the Government would be with regard to the members of the council of agriculture was a matter for future consideration.

Mr. WARREN: For the first twelve months the function of the council of agriculture would be to organise. Some of the best organisers were not on the Advisory Board. He had in his mind two men who had had vast experience in organising, and if the motion was carried those men would be cut out.

The CHAIRMAN: The amendment is a negative of the motion, and it is out of order.

Mr. O'SHEA (Strathpine) asked if the members of the Advisory Board were eligible to sit on the council of agriculture as representatives of the dairying interests?

Mr. DOUGLAS thought they were asking the members of the Advisory Board to do too much. It would be better to let them do their work on the Advisory Board and not appoint them to the council at all. It would be no detriment to those men to appoint five others to the council.

Mr. SLOAN said the representatives on the council would have different functions to the Advisory Board. They would appoint the organisers in the different districts according to the geographical positions.

Mr. McANALLY moved a further amendment—

> "That the gentlemen who have been appointed as members of the Advisory Board are ineligible to sit on the council of agriculture."

Mr. HOPPER seconded the amendment.

The amendment was put to the meeting and carried by 35 votes to 19.

Report of Proceedings of Dairy Conference.

The CHAIRMAN called for nominations to fill the five positions as dairy representatives on the council, and the following were nominated:—Messrs. McAnnally (Dalby), Douglas (Cooroy), Pentecost (Brisbane), J. Purcell (Toowoomba), Sloan (Atherton), Winnett (Kingston), Fitzgerald (Cambooya), Power (Burnett), and Todd (Warwick).

On resuming it was decided to elect the five members by ballot, and the election was then held.

The CHAIRMAN announced the result of the ballot as follows:—

Mr. H. McAnally (Dalby)	32 votes
Mr. A. S. Douglas (Cooroy)	38 votes
Mr. J. Purcell (Toowoomba)	55 votes
Mr. W. J. Sloan (Atherton)	44 votes
Mr. J. T. Tod (Warwick)	44 votes

That was an absolute majority, and he declared those five gentlemen duly elected by the Conference.

Mr. DOUGLAS asked the Premier whether he thought it wise to proceed with the various organisations that were now being formed in the country and then bring them under the bureau system later on.

The PREMIER: The best course to be adopted in regard to that matter would be to arrange for the conversion of those organisations that were now existing or about to be established into the local producers' associations that would be established under the scheme. When he met the fruitgrowers at Stanthorpe, the council of fruitgrowers there practically made the suggestion that their organisation was willing to come *en bloc* into the new organisation. It would mean, of course, that that organisation of fruitgrowers would have to adopt for their rules the rules provided by the council of agriculture for the local producers' associations. They would dissolve the old association and form themselves into a new association. The same thing could be done with the Farmers' Alliance, dairymen's associations, and various other associations of that kind, but there might be some organisations amongst the farmers which took part in political affairs, and he did not desire to dissolve their existing organisations. There would be no necessity in such case for them to dissolve, but it would assist the scheme if the existing organisations throughout the State would agree to merge into the large organisation. Facilities for that would be provided by the council of agriculture.

Mr. DOUGLAS: Would it be wise to suggest that those organisations join up with the different sections of the farming industry—the dairymen with the dairymen's associations, and the fruitgrowers with the fruitgrowers' associations, and so on?

The PREMIER: That was how it would be arranged. There were five great branches of the agricultural industry—fruit growing, wheat growing, dairying, sugar, and general farming. In each of those five branches there would be the sectional organisations, and those associations that were now organised in any one branch could easily be merged in the particular sectional organisation under the scheme.

Report of Proceedings of Dairy Conference.

Mr. JOHNSTON (provisional director of the new co-operative company being formed at Rockhampton) moved: "That Conference of dairymen place on record the appreciation shown by the Premier and Secretary for Agriculture towards the dairymen and farmers of Queensland."

Mr. McINTYRE (Mount Tyson): He was very pleased to be there to express similar opinions with regard to the Premier and the Secretary for Agriculture, and to express his thanks to them for the assistance they had given to the wheatgrowers in particular. The wheat pool instituted by the Government had been of great assistance to the wheatgrowers. If the Premier could better the conditions of the man on the land by the action he had taken, he deserved the thanks, not only of the farming community, but of the whole of Queensland and of the whole of Australia. (Hear, hear!) The Premier in his address stated that the farming industry was stationary—that it was not progressing. It was not progressing, and as far as his part of the country was concerned it was retrogressing. If the Premier, by the action he was taking, could stop that retrogression it would be a great achievement, and he would deserve the thanks of the men on the land.

The vote of thanks was carried by acclamation.

The CHAIRMAN: The Premier and himself appreciated the hearty vote of thanks which had been tendered to them, but the Government were equally grateful to the farmers present for attending the Conference. He considered that the Conference had been very successful. There was a lot of work in front of the members of the Advisory Board, who would find that they had assumed great responsibilities, but with that responsibility there was power to do things.

The CHAIRMAN then declared the Conference closed.

THE DAIRYING INDUSTRY ADVISORY BOARD.

Pursuant to the decisions of the Dairy Conference, the Advisory Board for the Dairying Industry has been constituted as follows:—

Chairman: Mr. E. Graham, Chief Dairy Expert (Government Representative).

Members.

Butter Section: Messrs. W. T. Harris, T. Flood Plunkett, and W. E. Dean.

Cheese Section: Messrs. William Purcell and Henry Keefer.

Condensed Milk Section: Mr. G. Burton.

Secretary: Mr. W. H. Franklin, Department of Agriculture and Stock.

Two sittings have taken place, at which consideration was given to the following matters and recommendations made to the Minister accordingly:—

The better service and design of trucks conveying butter, cream, and cheese to and from the factories.

Report of Proceedings of Dairy Conference.

The necessity for adequate provision being made for the cold storage of dairy produce at this port.

A reduction of rail freights covering dairy products in their manufactured state in transit to market.

Consideration was given to the obtaining of information concerning the market conditions of dairy produce in all available markets.

The matter of herd testing was fully discussed in all its phases, and a recommendation was made to the Minister for Agriculture requesting that consideration be given to increasing the number of stud dairy stock at the Queensland Agricultural College, with the view of assisting to provide the stud bulls necessary to supplant the inferior animals now employed in many dairy herds.

Information is being obtained as to the complement of stud bulls now available.

The Board unanimously endorsed the necessity of bringing into greater prominence the conservation of fodder, especially in the form of ensilage on dairy farms, and intend to urge dairy farmers to give attention to the construction of silos under a co-operative scheme as soon as the organisation will permit of such action being taken.

The improvement in the quality of dairy produce was considered by the Board, and the fullest information is being obtained concerning the results of pasteurisation of both milk and cream in other dairying countries; and the Board expect at a later date to be able to furnsh definite particulars in regard to the improvement in quality that may be effected by pasteurisation, also cost of plants, installation, &c.

The Board will sit again on Thursday, 6th April, in the room allotted for its use, at the Office of the Department of Agriculture and Stock, Brisbane.

HYDRO-ELECTRIC POWER.

The Minister for Agriculture (Hon. W. N. Gillies, M.L.A.), in the course of a statement to the Press, on his return from Tasmania, referred to a big Government water power scheme now approaching completion in the Island State. *Inter alia,* Mr. Gillies said:—

"What impressed me most, and which more than anything attracted me to Tasmania, was the Tasmanian Government hydro-electric power scheme, involving a probable expenditure of £2,750,000, which was started nearly six years ago. The scheme is not yet complete, but the power at present being generated is equal to 18,000 kilowatts or 20,000 horse-power, and is being supplied to various power users, including the Hobart Municipality for its tramways. It is also being supplied to the electrolytic zinc works at Risdon at about 50s. per horse-power per annum. The carbide works at Electrona use 3,500 horse-power, and will eventually use 7,500. Cadbury, Fry, and Co.'s works at Claremont are also supplied. In my opinion, cheap motive power being of such importance, nothing has been attempted that will be of greater benefit to Tasmania."

We have no great natural lakes in Queensland, but we have numerous great waterfalls, with power and water running to waste. We also have rivers that can be cheaply dammed, and thus create artificial lakes for power and also irrigation.

Organisation of the Agricultural Industry. A State-wide Co-operative Scheme.

ENRICHMENT OF RURAL LIFE.

A Summary of an Address by the Premier, the Hon. E. G. Theodore, M.L.A., to the farmers of the Laidley District, focusing the effects modern social and economic changes are having upon the primary industries, outlining a scheme for the State-wide and effective organisation of the Agricultural Industry, and explaining generally a far-reaching and constructive rural policy.

PREMIERS' ADDRESS TO LAIDLEY FARMERS.

On 21st February, before a large and representative gathering of farmers of the Laidley district, the Premier (the Hon. E. G. Theodore, M.L.A.) discussed the difficulties confronting primary producers, suggested solutions of present problems, and sketched a broad and practical scheme for the general betterment of the agricultural industry and the enrichment of rural life.

The main points of the Premier's address are summarised as follows:—

The Importance of Agriculture—

The Government has never underrated the importance of agriculture. It has always recognised that the future of the State is intimately associated with the soil, and agriculture is the basis of all our future hopes. No one has a greater claim to be regarded as a worker than the man who tills the soil; and no one is more entitled to participate in shaping the policy and governing the affairs of this State than the members of that great and influential class. The farmer is the mainstay of our civilisation and the most indispensable worker in the community. The Government recognises the importance of the cultivators of the soil and the acuteness of their problems. The main features of its policy are those dealing with the encouragement of agriculture and the protection of the man on the land. Much of the time and energy of the Government, since 1915, have been devoted to translating that platform into effect, as is evidenced by the following list of legislative and administrative achievements:—

1. **Cane Prices Regulation,** which for the first time in Queensland ensured to the cane-growers a fair price for their product. It can reasonably be claimed that this scheme has benefited the cane-farmers to the extent of not less than one million pounds sterling since 1915.

2. **The Sugar Acquisition Agreements.**—These agreements have stabilised the price of sugar, and made the sugar industry the most prosperous business in the State. In 1915 the value of the sugar products of this State was computed at £1,500,000; in 1921 it had increased to over £9,000,000.

3. **The Repeal of the Railway Guarantee.**—This measure relieved the farmer of the railway land tax.

4. **The Queensland Wheat Pool,** which enables the wheat crops to be marketed under better conditions than ever obtained in the past.

5. **Advances to Settlers.**—The entire system of State advances to new selectors has been liberalised and brought up to date.

6. **Co-operative Agricultural Production.**—The Government instituted the system of advances for the purchase of dairy cattle. Advances under this Act have been made to 552 farmers.

7. **Cold Stores for Farmers' Produce.**—The Government is erecting a modern cold store with a capacity of 600,000 cubic feet of cold storage space for butter, cheese, fruit, vegetables, and eggs.

8. **Main Roads Scheme.**—The Government has launched a comprehensive policy for the improvement of the main roads of the State. Particular attention is being given to the roads in agricultural districts.

9. **Cotton Cultivation.**—A guaranteed fair price is being granted to the producers of cotton by the Government, with the result that this industry is rapidly expanding.

10. **Relief to Settlers on Repurchased Estates.**

11. **Amendment of Income Tax Act.**—This enables the farmer to carry forward the losses of previous years when calculating his income for taxation purposes. Queensland is the first State to carry this reform.

12. **Drought Time Assistance to Farmers.**—The Government dealt generously at all times during the droughts of 1915 and 1919 when they were appealed to by the farmers. Seed wheat and fodder for starving stock were distributed on the most generous terms. As much as 87,000 bushels of seed wheat were distributed among 1,400 farmers in one year. Aid in many other ways was given to farmers during the drought period.

In addition to the foregoing, the Government has responded to every reasonable request made by farmers for protection and encouragement. The following measures have been passed solely in the interests of the agricultural industry:—

Cheese Pool Act.
Banana Industry Preservation Act.
Fertiliser Act.
Stock Foods Act.
Diseases in Stock Act.
Brands Act.
Supervision of Produce Agents.
Research for Eradication of Pests.
Marketing of Farmers' Wool.
Fruit-growing Instruction.
Free Soil Analyses for Farmers.
Cheap Arsenic for the Destruction of Prickly-pear.
Pure Seeds Act.

The Producer and Consumer—Identity of Interest—

In recent times there has been a distinct move towards the amalgamation of the forces of the farming community and city consumers for the purpose of giving effect to a mutually beneficial programme of legislation and reform. This movement has gained great headway in the United States of America and in Canada. An identity of interest is recognised by both these interdependent sections; and this is expressed by a platform mutually agreed upon, and which is by force of combination being gradually forced into effect.

A comprehensive and constructive policy for the future development and encouragement of agriculture is the greatest need in this State at the present time.

A prosperous and expanding agricultural industry and a contented rural population should be our most serious aim.

In Queensland we have passed the gold era, and have not yet begun a manufacturing era; but we are on the threshold of a great agricultural era.

We have been endowed by Providence with a wonderful heritage—a land which is richer in natural resources, climate, and fertility than any other undeveloped country on earth.

It is to agriculture, and to the industries dependent on agriculture, that we must turn our attention in formulating future policies.

A large measure of our future energy and constructive ability must be devoted to the solution of agricultural problems.

A Tangible and Realisable Objective—

The Premier laid down the following as a tangible and realisable objective:—

1. Agriculture as an industry must be made a remunerative industry to those engaged in it.
2. The industry must be greatly extended, for only in that way can an additional population be absorbed; and it is only by increasing the population that we can reduce our per capita financial burdens.
3. The conditions of life of all country dwellers must be made more attractive than at the present time.

An agricultural policy, to be effective, must include proposals dealing with all of the following topics; these would constitute some of the leading planks of an agricultural programme:—

1. Co-operation.
2. Pools.
3. Advisory Boards for the different sections of the agricultural industry.
4. Agricultural education.
5. Main roads.
6. Extension of social amenities to rural life.
7. Opening land for settlement.
8. Representation abroad to promote trade for primary products.

Under the present limited extent of co-operation among those engaged in the primary industries, the farmers are the greatest sufferers from market fluctuations.

When depression occurs in the market price of products, the farmer has to bear almost the entire burden of the fall.

The middlemen gain most of the advantages by refusing to lower prices to the consumers.

When there is a rise in prices, the middlemen enjoy the benefits, for the simple reason that the increases in prices are not passed on to the producers.

Neither the producers nor the consumers gain any advantage from market fluctuations.

Effective Co-operation the Need.

The farmer by establishing effective co-operation can remove many of the difficulties that exist in connection with the marketing of his produce, and can eliminate a great deal of the middlemen's profits.

Co-operation is the best form of self-help for the man on the land.

In the United States of America the co-operative principle has been extensively developed in the farming community, with the result that farmers in that country are more prosperous than farmers in any other country of the world.

What has been done in the United States can be done in Queensland.

If farmers made use of the co-operative principle, they could solve all the problems relating to production, transportation, distribution, finance, and marketing of their products.

The Queensland Wheat Pool—

The Queensland Wheat Pool is a living example of what can be done by the farmers by co-operative effort.

The Queensland Wheat Pool is based upon pure co-operation.

The farmers constitute the Board of Management, formulate the policy, and direct the whole business of marketing the wheat crop, which previously was done solely by traders and commission agents.

The farmers had never managed this business before; but with little preparation they secured the necessary parliamentary authority, established the pool, appointed a staff, devised the machinery of administration, arranged the finances, and in the first year handled the whole crop of 4,000,000 bushels, which was a record crop for Queensland.

Speculating in wheat was prevented, middlemen's profits were eliminated, the business was managed for one-third the ordinary cost of marketing, and the farmers were paid the full value for their wheat.

What has been done by the farmers in connection with wheat can be done with all other staple products.

The Full Tide of Agricultural Co-operation—

It is not contended that co-operative action in the handling of other products can be done as easily as it was done with regard to wheat. The full tide of agricutural co-operation will not be realised until a great deal of

preliminary organisation has ben undertaken in the farming communities. This is necessary in order to educate the community up to the principles of the scheme and to prepare the way for the efficient management of a complex business. In America similar preliminary work has been undertaken by what are known as Farm Bureaux, which have been established in every farming locality.

The objects of this organisation are to encourage and promote co-operation among farmers in every effort to improve facilities for the economic and efficient production, conservation, marketing, and distribution of farm products. They also study the questions of constructive rural legislation and assist in the determination of agricultural policies. Procedure on similar lines is applicable to Queensland.

Some kind of basic organisation must be established among the farmers by the farmers themselves.

Through the agency of such an organisation the farmers will be assisted to solve the problems of production and marketing and become the driving force toward co-operative effort. These organisations would become the medium for the spread of knowledge and education, and would enable farmers to become articulate as a class, and a real force in the land.

District Agricultural Councils—

As an organisation corresponding with the American Farm Bureaux, the Premier advocated the establishment in all farming localities of District Councils of Agriculture; these to be linked up with a Central Council having jurisdiction over the whole State. These Councils should be elected by the farmers by direct vote, and should work in close co-operation with the Department of Agriculture.

The objects of the organisation should be to co-operate with the Department of Agricuture—

1. In the development of rural industries.
2. Investigating and dealing with agricultural problems.
3. In advising agriculturists with regard to matters which require scientific knowledge and training.
4. In securing effective action for the controlling of diseases and pests generally.
5. In securing improved markets for the disposal of farm produce.
6. In formulating a general policy of standardising.
7. To advise in regard to agricultural education and rural schools.
8. To recommend, when necessary, the formation of advisory boards or pools to deal with wheat, butter, cheese, fruit, or other sections of the industry.

If the scheme is favourably received by the farmers, they will unite themselves to take up the idea. The Government will give them every encouragement and assistance. In the United States, officials known as rural agents are appointed. These are men with practical and technical knowledge of agriculture, and of all problems relating to agriculture, who keep in close touch with the Farm Bureaux, and are of immense service in the farming

communities. It will be seen that, if the farmers are organised in the way suggested, the establishment of large co-operative schemes will be easy of attainment. Sporadic attempts at co-operation are useless. The cost of management in small co-operative enterprises is too high, and the management often inefficient. That is the reason why co-operation on a small scale often fails.

State-Wide Co-operation to Stabilise Markets.

If the farmers are willing to establish co-operation on a large scale, the Government will confer the necessary authority upon the co-operative associations, and, moreover, will back them financially. By State-wide co-operation embracing all sections of primary production, the industries will be emancipated from market manipulators. The movement will bring about stabilised prices for primary products. It will give farmers access to larger markets, and it will secure a better equilibrium of supply and demand. It will tend to reduce farm costs and costs of transportation, and will save the farmers from the evil effects of market gluts.

There is absolutely no reason why, under a properly managed system of co-operation, the whole of the products of the farming community should not be handled, marketed, and financed by the farmers themselves. The operations, necessarily, will be on a large scale; but the magnitude of the operations is no barrier to the success of the scheme.

The Wheat Pool Transactions—

The Wheat Pool transactions last year involved one million five hundred thousand pounds sterling. The Wheat Pool dealt with only one commodity. All primary produce—wheat, dairying, fruit, and, if necessary, wool produce from grazing farmers—could be handled under the scheme outlined by the producers without intermediate aid. The pool idea is merely the application of the commercial combine to the producing industry, but with this notable distinction:—That, where it is managed by farmers' co-operative societies, the profits and the whole advantage gained from efficient management and reduced costs are retained by the producers.

These proposals for the better organisation of the farmers by means of Agricultural Councils are advanced on the ground that such preliminary organisation is necessary to prepare the way for the real business of co-operative dealing on a large scale. The agricultural industry is bound to grow to very large dimensions in Queensland; and amongst the farmers there are men of brains, knowledge, and experience whose advice should be sought in connection with the formulation of an effective agricultural policy.

The Problem of Undeveloped Lands—

No rural policy would be complete which did not provide for the extension of agricultural settlement. This can be accomplished in Queensland by providing closer settlement on the areas now occupied, and by opening new Crown land for occupation. Both these modes will be adopted by the Government and proceeded with as rapidly as possible.

Considerable areas of good land owned by private individuals, but not put to any productive use, may be seen in various parts of the State adjacent to existing railway lines. The non-development of this land is seriously retarding the progress of the State. Large areas of idle land in the vicinity of existing settlements hamper the operations of the selectors. Such lands are

breeding grounds for pests, besides being responsible for sparse and scattered settlement. The Lands Department experts have been asked to study the question and report upon the best means of dealing with it.

Irrigation—

Surveys and investigations carried on by the Water Supply Department during the last two or three years have revealed the existence of several extensive, yet compact, areas eminently suited to the purpose of irrigation settlements. The Dawson River scheme embraces nearly a quarter of a million acres of irrigable lands of high quality, and a proposal for a reservoir which will have a capacity of over 1,000,000 acre feet of water. It is expected that this scheme will eventually accommodate upwards of 10,000 irrigation farmers.

Another scheme which has been very favourably reported on is that of the Lower Condamine, in the vicinity of St. George. A succession of weirs in the river between Warra and St. George will impound 150,000 acre feet of water, which will be sufficient to irrigate 50,000 acres of land. The soil and climate are both ideal for raisins and other dried fruits, or lucerne and like crops. As a fruit and dairying centre its future, if water is made available, is most promising. At least 1,000 families could be settled in this area. There were other highly-promising schemes beside those he had mentioned. The Mount Edwards proposal and the one on the Severn River are likely to be developed into valuable irrigation settlements at no distant date.

These schemes will be the means of increasing our rural population and the wealth production of our State to an enormous extent. But to carry them out the Government expects and requires the solid support of all our people who have the interests of agriculture at heart. There is a large and influential section in the cities always ready to hamper the Government in proposals of this kind, and throw cold water on development schemes that involve the expenditure of large sums of money in country districts. It is to combat these Queen-street interests that the Government appeals for the co-operation of the country residents.

An Improved System of Agricultural Education.

A consideration of the work being done by the present Agricultural College shows that the College is not satisfactorily fulfilling the purpose for which it was established. The Government has endeavoured to discover the causes which have militated against the success of this institution, and, at the same time, to devise plans for an extended and improved system of agricultural education.

In formulating a policy on this subject the Government may decide to discontinue the Agricultural College as it is constituted at present. An endeavour will be made to co-ordinate agricultural tuition with the general system of State education, providing thereby a scheme of agricultural secondary schools for all pupils leaving the primary schools who decide to take an agricultural course. The secondary course will lead up to the University for those who desire to avail themselves of the benefits of that institution.

Conditions of Rural Life—

It is undeniable that under existing conditions agricultural life is unattractive. There is an exodus of farmers' sons towards the cities. The towns grow large while the rural population remains stationary. This is an

evil which is grievously afflicting a great many countries at the present time. It is a problem which in Queensland we must solve at all cost: our future prospects are vitally connected with land settlement and an increase of rural population. It is our bounden duty, therefore, to encourage people to remain on the land, as well as to induce others to leave the towns and take up an agricultural career. To accomplish this, the life must be made endurable. The Government is willing to assist the farmers' organisations in any practicable schemes for the improvement of the social necessities of the rural commodities. The Councils of Agriculture, if they are established, will doubtless give attention to this vital problem.

Idealistic and Visionary Policies Useless—

The Premier invited the producers of the State to give earnest consideration to the policy he had outlined. It was by no means a policy spun out of political moonshine, but an earnest attempt to put forward a constructive policy for the development of the principal industry of this State, and the emancipation of the struggling farmer from the evils that at present beset him. Nor was it a policy shadowy and unattainable. It was the essence of practicability. He did not believe that all that was required was to "tickle the earth with a hoe and she will smile a harvest." The farmers were faced with the stern realities of existence, and idealistic and visionary policies were useless. The policy outlined was one that can be carried into effect if the farmers lend their support. It will take millions of pounds sterling to establish co-operation on the extensive scale advocated and to finance the projected development schemes; but the money is available, because this country has the resources. The capitalised energy and the resources of the man on the land ought to be good enough for a vast amount of credit to finance co-operative enterprise, even of gigantic dimensions. Cities and towns in this State are able to raise scores of millions in the aggregate for local enterprises, water supplies, tramway schemes, street lighting, and sewerage. What would the assets of the towns be worth if the agricultural industry ceased to exist? If city dwellers, who are dependent upon the prosperity of the primary industries, can raise millions of money for their schemes, surely the agricultural industry, whose resources are manifold, can capitalise these resources, if the credit to be raised is to be used to further enhance the wealth and productiveness of the State!

COUNCIL OF AGRICULTURE.

The representatives of the dairying industry on the Council of Agriculture, selected by the Dairy Conference, are:

Mr. H. McAnally (Dalby);

Mr. J. Purcell (Toowoomba);

Mr. W. J. Sloan (Atherton);

Mr. J. T. Tod (Warwick);

Mr. A. S. Douglas (Cooroy).

The selection of representatives of other branches of agriculture—sugar, wheat, fruit, and general farming—is now proceeding.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1922.

The number of eggs laid during the month showed a decided decrease. Rain fell on 16 days out of the 28, consequently assisting the drop in production at this period of the test, when checks caused by broodiness and changeable climatic conditions have a tendency to encourage moulting. Mr. Fanning had the misfortune to lose his A. White Leghorn, the cause of death being a tumour on the left lung. The birds generally look bright, and are feeding very well. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	111	1,448
*W. and G. W. Hindes	Do.	116	1,433
*T. Fanning	Do.	109	1,395
*Mrs. R. Hodge	Do.	106	1,391
*H. Fraser	Do.	100	1,350
R. Gill	Do.	73	1,314
Oakleigh Poultry Farm	Do.	98	1,271
*C. M. Pickering	Do.	82	1,264
*G. Trapp	Do.	63	1,259
F. Birchall	Do.	74	1,245
*W. Becker	Do.	82	1,225
*Thos. Taylor	Do.	91	1,209
*C. Goos	Do.	93	1,204
R. C. Cole	Do.	85	1.204
W. A. Wilson	Do.	95	1,201
*R. C. J. Turner	Do.	70	1,200
Mrs. E. White	Do.	101	1,198
*Thos. Eyre	Do.	70	1,195
H. C. Thomas	Do.	74	1,191
*S. L. Grenier	Do.	104	1,190
*H. C. Towers	Do.	63	1,190
*Mrs. L. Anderson	Do.	97	1,173
*E. Chester	Do.	86	1,167
*E. A. Smith	Do.	86	1,161
Bathurst Poultry Farm	Do.	85	1,161
*G. Williams	Do.	90	1,160
*J. W. Newton	Do.	57	1,153
J. W. Short	Do.	69	1,141
M. F. Newberry	Do.	76	1,136
*H. P. Clarke	Do.	89	1,122
Henry Stacey	Do.	75	1,121
*Haden Poultry Farm	Do.	89	1,120
*B. Chester	Do.	74	1,119
W. Barron	Do.	67	1,111
O. C. Goos	Do.	55	1,061
Linquenda Poultry Farm	Do.	95	1,049
Mrs. E. Z. Cutcliffe	Do.	63	1,031
E. Stephenson	Do.	63	1,016
W. N. Glover	Do.	64	974
Brampton Poultry Farm	Do.	75	973
*W. and G. W. Hindes	Brown Leghorns	78	972

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	103	1,396
*R. Burns	Do.	93	1,362
W. Becker	Langshans	117	1,352
*T. Hindley	Black Orpingtons ...	89	1,328
*A. E. Walters	Do.	75	1,312
*Parisian Poultry Yards	Do.	79	1,294
*C. C. Dennis	Do.	92	1,275
*J. Ferguson	Chinese Langshans ...	82	1,246
Jas. Ryan	Rhode Island Reds ...	94	1,227
*E. Morris	Black Orpingtons ...	87	1,226
G. Muir	Do.	74	1,215
Rev. A. McAllister	Do.	69	1,207
*E. F. Dennis	Do.	67	1,178
*J. Cornwell	Do.	91	1,170
*N. A. Singer	Do.	84	1,161
Jas. Every	Langshans	60	1,141
Jas. Potter	Black Orpingtons ...	71	1,126
*J. E. Smith	Do.	85	1,117
*E. Oakes	Do.	103	1,098
*R. Holmes	Do.	60	1,094
*H. M. Chaille	Do.	88	1,084
*Mrs. G. Kettle	Do.	100	1,081
G. Cumming	Do.	87	1,075
*A. Shanks	Do.	79	1,074
*E. Stephenson	Do.	72	1,073
J. W. Newton	Do.	64	1,013
F. Harrington	Rhode Island Reds ...	82	982
T. C. Hart	Black Orpingtons ...	87	933
Total	...	5,747	81,338

* Indicates that the pen is engaged in single test.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	234	243	270	234	272	195	1,448
W. and G. W. Hindes (W.L.) ..	251	225	239	255	241	222	1,433
T. Fanning	247	226	255	220	221	226	1,395
Mrs. R. Hodge	230	233	257	238	241	192	1,391
H. Fraser	268	195	241	234	221	191	1,350
C. M. Pickering	235	219	223	190	210	187	1,264
Geo. Trapp	225	190	231	203	216	194	1,259
W. Becker	229	228	193	194	211	170	1,225
Thos. Taylor	208	200	201	173	182	245	1,209
C. Goos	212	223	178	151	174	266	1,204
R. C. J. Turner	204	193	200	197	191	215	1,200
Thos. Eyre	219	193	161	194	225	203	1,195
S. L. Grenier	194	227	172	205	201	191	1,190
H. C. Towers	205	183	208	165	186	243	1,190
Mrs. L. Anderson	207	211	181	192	206	176	1,173
E. Chester	223	187	180	187	188	202	1,167
E. A. Smith	237	165	214	200	191	154	1,161
G. Williams	258	207	166	165	193	171	1,160
J. W. Newton	206	220	230	190	128	179	1,153
H. P. Clarke	234	151	197	158	205	177	1,122
Haden Poultry Farm	128	191	213	204	189	195	1,120
B. Chester	157	172	213	194	204	179	1,119
W. and G. W. Hindes (B.L.) ..	152	174	149	117	150	230	972

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	176	201	281	203	237	264	1,362
T. Hindley	234	230	246	179	206	233	1,328
A. E. Walters	262	224	219	202	200	205	1,312
Parisian Poultry Yards	222	218	207	289	156	202	1,294
C. C. Dennis	206	189	198	238	226	218	1,275
J. Ferguson	208	202	203	234	209	190	1,246
E. Morris	220	211	154	227	209	199	1,226
E. F. Dennis	193	206	195	177	194	213	1,178
J. Cornwell	162	208	191	214	181	214	1,170
N. A. Singer	210	190	179	198	172	212	1,161
J. E. Smith	242	262	170	129	160	154	1,117
E. Oakes	182	185	182	212	164	173	1,098
R. Holmes	155	200	193	188	203	155	1,094
H. M. Chaille	143	198	194	219	176	154	1,084
Mrs. G. Kettle	182	207	232	111	169	180	1,081
A. Shanks	151	181	176	193	166	207	1,074
E. Stephenson	214	175	195	197	136	156	1,073

CUTHBERT POTTS,
Principal.

SUGAR: FIELD REPORTS.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 6th March, 1922, as follows:—

"*Babinda.*—At the end of January crops had improved very much since my last visit, early in December. At that time the area known as Bucklands looked backward, but at the end of January the cane there had improved very much. Some fine crops of plant Badila were seen on the farms of Messrs D. O. James, Wilson, Irven, and Harrison, and also upon a few other farms adjacent to Mirriwinni.

"Around Mooliba, and on Cameron's Branch, some very good cane was noticed, the cane generally having a good growth and colour and being in a very clean state.

"Manuring has also been carried out much more extensively than formerly, and by its aid and the improved cultivation methods now in use, a good crop should result from this area. In a number of places plants obtained from the South Johnstone Experiment Station were noticed growing, and thus their suitability for local conditions can be ascertained by the interested farmers. Taking the Babinda area all around, its recent growth is most noticeable. Good roads are now being made to all of the outside areas.

"*Cairns and Hambledon Districts.*—Most of the cane seen in these areas also looks well. Near Kamma some very fine D.1135, both plant and ratoon, was noticed. This soil seems to suit this variety pretty well. No signs of grubs are apparent.

"For the past year Hambledon mill crushed 87,000 tons. By the present appearance of the crops, and also the fact that the Freshwater cane is now due for the mill, these figures should be easily exceeded for 1922.

"*Herbert River District.*—This centre was visited early in February. Up to that time the total rainfall for the year amounted to 2.82 in. Conditions, however, changed, as very heavy rain set in upon the 11th instant, continuing without intermission for six days, aggregating a total of 32.16 in. up to the 17th instant, or giving a daily average fall of 5.36 in. This torrential downpour meant that a very large portion of the cane areas was under water for some days, and it was impossible to say how the crops had fared at the time of my departure from the district. Prior to this fall, although short of rain, the crops generally looked very green and healthy, and the outlook for a successful season was most promising.

"A very large amount of liming, green manuring, and fertilizing is being carried out. Some 1,000 tons of earth lime obtained through the Farmers' League

has been used in preparatory work for this season's crop. This lime seems to be of a very good quality, and can be delivered on the farms at about £2 per ton. Several farmers are using large quantities of the lime; one has had 63 tons, whilst another, besides using about 60 tons, has another 30 tons on order.

"Green manuring has also formed an important part in the cultivation work of the district this year, and some very fine crops of beans are in evidence. Of fertilizers, a very large quantity has been used; but, as most of the farmers order their own, it was difficult to obtain a record of quantities used.

"Of the different varieties of cane grown in the district, H.Q.426 (Clark's Seedling), Badila, H.Q.409, Black Innis, and 7R.428 are the most grown. Probably the two former canes are grown in about the same proportion. A fair quantity of H.Q.409 is also now going in, as are also small quantities of the varieties lately being supplied by the C.S.R. Co., *i.e.*, Nanemo Korpi and Oarambo.

"Although beetles were very numerous in this area a couple of months ago, so far no signs of grubs are apparent.

"*Lower Burdekin.*—This district was reached in the third week of February; the cane looked splendid everywhere. With a continuance of favourable weather conditions, very heavy crops should be harvested on the Burdekin in the coming season. Some of the cane showed remarkably high density returns. During the end of September and throughout October canes such as H.Q. 426, B.208, and Badila were analysing from 19 per cent. c.c.s. to 19.7 per cent. c.c.s. This latter was B208, and was worth the high price of 78s. 6¾d. per ton. One grower's return of 800 tons gave him an average of 16.88 c.c.s. The following figures give the average density of green cane treated during the season:—

Variety.	Average c.c.s.
B.208 plant	17.34
Badila ratoons	17.04
Badila plant	16.40
H.Q.426 (Clark's Seedling) plant	16.25
Imperial plant	15.50
Q.813 plant	15.48
N.G.24 plant (Goru)	15.41
Q.903 plant	15.29
24B plant (Goru)	15.22
M.1900 plant	15.18
Q.970 plant	14.83
Q.855 plant	14.48
Malagache plant	13.99
Q.1133	13.10

"Around Kalamia a large area of ground is being got ready for planting, and conditions, generally, are very satisfactory."

The Southern Field Assistant, Mr. J. C. Murray, reports under date 7th March, 1922, as follows:—

"*Mackay.*—In February the Mackay district was visited in connection with the work of the Bureau of Sugar Experiment Stations. Taking the sugar industry as it exists at present in Mackay, one cannot help being struck by the progress the district has made during the last few years, especially regarding agricultural methods and in the employment of improved implements. There is also a larger interest now taken in varieties of cane, and there is a greater desire on the part of many growers to follow out the scientific experiments of the stations as found in the annual reports of the Bureau.

"Taking the sub-areas in detail, I find that immediately around the city of Mackay there are good crops of cane and well-tilled soil. Numbers of farmers have ploughed in cowpea as a green manure, in addition to stimulating their crop with a concentrated fertilizer. Manures are applied in varying quantities per acre, as previous experience or local experiments dictated. The application of lime is more general than hitherto, mostly taking the form of pulverized limestone.

"The canes giving the best monetary returns to the grower are H.Q.426, Q.813, D.1135, 190 Seedling, and Badila. All gave high c.c.s. values this year. It is advisable for those farmers who are growing 1900 Seedling not to cut to early. October is a good month to harvest this variety.

"More subsoiling could be done in the sub-area under review. Soil well loosened down to a depth of, say, 20 in. has greater water-conserving properties in dry weather and allows of a deeper root system.

"Cane pests have done a minimum of damage here this season. Farmers have reported minor destruction of cane plants by grubs and wire worms, but nothing of a serious nature.

"Further up the Pioneer, towards Marian and Pleystowe, good crops of cane are in evidence. At the former place a little striped leaf disease is showing in H.Q.426, and may account for the fluctuating c.c.s. tests that are occasionally mentioned. Canes doing particularly well at these two places are 1900 Seedling, Malagache, and Q.813. A small area is under H.Q. 285, and is looking well. This cane, grown in conjunction with 1900 Seedling, should be profitable on account of its early maturing qualities. Q.813 is a cane that has come to stay in these farm areas, and will probably become a staple variety.

"A visit was paid to the Mount Jukes district. There is some very good sugar-land in this area, and settlers who are already there are doing well. The Marian Sugar Milling Company has a tramline tapping the best land; and, judging by the cane growth and quality of the cleared land (soil of a rich dark loam, heavy in humus), should take a lot of cane from this locality.

"Good conditions prevail on Cattle Creek. Grubs have been giving the growers a little trouble, but no great financial loss has been experienced. There is some magnificent cane-producing soil both here and on Owen's Creek. The line is being pushed rapidly over the route of the Gargett-Owen's Creek Railway, much to the satisfaction of the settlers.

"With the exception of a little more cultivation, and, perhaps, lime, it would be difficult to improve much of the Pinnacle Plain country; that is, where the cane is grown. The soil is a heavy dark loam, very rich in humus, and well drained. Varieties that are growing well are D.1135, Clark's Seedling, Badila, and 1900 Seedling. In harvesting the latter variety, farmers are advised not to cut before October. Farmers find the D.1135 the most resistant to cane-grub attack.

"At the time of visiting this area, the various streams were running clear and strong, while the tropical jungle on the mountain slopes shone a vivid green. The weather was very hot and humid.

"At Eton the farmers are satisfied with their industry. High values have been obtained for the cane, and the people are more contented in their hard and continuous work under tropical suns than they have been for years.

"Very little industrial trouble has been recently experienced. Indeed, this applies to the whole of the Mackay district.

"The following are some of the 'densities' from cane sent to Eton Mill, supplied by Mr. Jackson:—

H.Q.426	17.1	(Plant crop 30 tons per acre)
Q.813	16.5	(Plant crop 35 tons per acre)
B.147	14.3	(Plant crop 30 tons per acre)
Q.855	14.3	(1st ratoons)
M.1900	13.1	(Plant crop 30 tons per acre)
B.208	16.1	(Plant crop 30 tons per acre)
N.G.15	16.5	(Plant crop 34 tons per acre)
Green Goru	14.1	(Plant crop 30 tons per acre)

"Other canes that are doing well for the growers in the Eton district are D.1135, Malagache, Q.903, and Q.970.

"The farmers here, generally speaking, are up to date in their methods, although deeper cultivation and green manuring are necessary. The growers met were anxious to receive and impart information.

"At Homebush the cane growth indicates a promising yield for next season. The cane has, so far, received no check from adverse weather conditions or disease. The cultivation is uniformly good, but the texture and producing powers of the soil would be increased by the use of vegetable manures. Lime is also required, as indicated by several tests made in a petri dish with litmus papers.

"Varieties doing well include H.Q.426, M.1900, Q.813, H.Q.285, 'Pompey' (a cane introduced by the C.S.R. Company), D.1135, and Malagache. As the growers here will be paid in the future on c.c.s., the canes most profitable would probably be 1900 Seedling, Q.813, and H.Q.285. In common with the previously mentioned canegrowing areas, Sarina is preparing for a heavy crushing. Right up the fertile flats on Plane Creek the cane is making a rapid growth, with a minimum of disease or insect parasite interference. This latter is largely due to care taken in plant selection—the only safe way to prevent the spread of insidious diseases such as 'gumming' and 'striped leaf disease.' The more careful a grower is in plant selection, the more likely he is to have a uniform density in the crushing.

"A considerable amount of fertilizing is being done on the Plane Creek areas. The farmers are discussing the question of going in more extensively for this in the future.

"Varieties showing good growth are D.1135, M.1900, H.Q.426, H.Q.285, and Q.813. All these canes are making weight rapidly. The cultivation is good on Plane Creek at present.

"North of Mackay the Farleigh country is showing the effect of the good growing weather. The different varieties are making cane satisfactorily, and the farmers anticipate a good season. Fertilizers (principally sulphate of ammonia applied between the light showers of rain that have been constantly falling) are being used to stimulate growth. Practically no disease is in evidence. Grubs were causing minor losses, but nothing to worry the farmer seriously. If the infestation increases through the year, the planting of D.1135 as a resistant variety would be advisable; also the trial of repellants, such as carbon bisulphide.

"Varieties doing well are Q.813, M.1900, M.187, M.87, H.Q.426, and H.Q.285. The mill is anticipating a big supply of cane next season from the Homebush areas, and the crushing for this plant should be a record one."

HORTICULTURAL NOTES.

By E. W. BICK, Curator, Botanic Gardens.

Chrysanthemums should now be showing flower buds, and will benefit greatly with a little liquid manure once or twice a week. Towards end of month dahlias will be going down. Don't disturb them too soon. Should the ground be required they may be removed to a sheltered situation and heeled in to allow bulbs to ripen. This must be done gradually. Don't cut off tops when in a green state; it weakens the bulbs, often killing them. Some of the free-flowering pæony dahlias, notably the Geisha, make very weakly bulbs that, if disturbed before being properly ripened, are apt to die out. Many dahlia-growers have lost the Geisha. It is rather a ticklish thing to winter. The safest plan is to allow it to remain in its flowering position until thoroughly ripened, or, if in a well-drained position, it may be left until next planting season.

Stocks may now be planted out. Like many other plants of this natural order (Cruciferæ—cabbage family), particularly cauliflower, they delight in newly cultivated ground. Garden beds that have been growing flowers continually for many years should have the soil renewed for these crops. Although it may have been frequently manured, a change of soil is necessary. This is often unobtainable except at very heavy expense. Another danger is that nut grass or some other obnoxious pest may be introduced in the new soil. A plant that should be more grown for soil renovation is the lupin. They may be obtained in many attractive colours, and the root action of lupins improves the soil, apparently by bacterial action, very much.

Another sowing of sweet pea seed should be made. The later planted ones often do well. The weather is cooler, growth stronger, and better flowers may be looked for.

This is a good time to plant bouvardias. These beautiful flowering plants can be obtained in many colours and varieties. They have not been grown much of recent years about Brisbane, but they are well worth a trial. A good, free soil, similar to that carnations are grown in, suits them best.

Seeds of winter and spring flowering annuals may still be sown, and plants of those from seeds planted should be planted out. Keep the soil well cultivated about newly planted annuals.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records of Cows for February, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Prim	Holstein ...	6 Feb., 1922	1,369	3·8	58·01	
Lute	Ayrshire ...	8 Jan. ,,	1,081	4·2	52·36	
Lady Annette ...	,, ...	2 Jan. ,,	888	4·6	48·48	
College Evening Glow	Jersey ...	10 Oct., 1921	712	5·6	47·68	
College Cold Iron	,, ...	25 Jan., 1922	760	5·2	47·42	
Thyra of Myrtle-view	Ayrshire ...	31 July, 1921	1,035	4·0	46·21	
Lady Mitchell ...	Holstein ...	20 Dec. ,,	872	4·4	44·78	
Little Buttercup...	,, ...	12 Dec. ,,	1,174	3·4	43·23	
Glow VI.	Guernsey ...	28 Aug. ,,	566	6·2	41·64	
Auntie's Lass ...	Ayrshire ..	31 Oct. ,,	1,042	3·6	41·60	
Buttercup	Shorthorn...	28 Oct. ,,	981	3·8	41·49	
Hedges Madge ...	Holstein ...	15 Aug. ,,	802	4·4	41·18	
Iron Plate	Jersey ...	12 July ,,	780	4·4	41·16	
Magnet's Leda ...	,, ...	8 Feb., 1922	707	4·6	38·64	
College Promise ...	,, ...	6 Jan. ,,	673	4·6	36·98	
College Mignon ...	,, ...	7 July, 1921	679	4·6	36·59	
College Prima Donna	Holstein ...	17 Nov. ,,	730	4·2	35·82	
Skylark	Ayrshire ...	7 Feb., 1922	660	4·6	35·52	
College Bluebell ...	Jersey ...	22 Oct., 1921	762	4·1	34·96	
College St. Margaret	,, ...	25 Sept. ,,	634	4·6	34·77	
College Ma Petite	,, ...	5 Feb., 1922	539	5·2	32·77	
Lady Meg ...	Ayrshire ...	25 Jan. ,,	767	3·8	32·60	
Netherton Belle ...	,, ..	30 Nov., 1920	471	5·8	31·89	
Bellona	,, ...	26 June, 1921	697	4·0	31·18	
Nina	Shorthorn...	11 Nov., 1921	713	3·8	30·16	
Yarraview Village Belle	Guernsey ...	6 Aug. ,,	365	7·4	30·16	
Yarraview Snowdrop	,, ...	14 Oct. ,,	505	5·0	29·25	
Miss Betty ...	Jersey ...	7 July ,,	565	4·2	27·51	
Miss Security ...	Ayrshire ...	20 Aug. ,,	753	3·2	26·46	
College Wildflower	Jersey ...	10 Dec. ,,	622	3·6	24·92	
Sweet Meadows ...	,, ...	31 Oct. ,,	425	5·2	24·38	
College Meadow Sweet	Holstein ...	17 May ,,	487	4·2	24·29	
Gatton Glitter ...	Guernsey ...	9 Sept. ,,	546	3·8	23·28	
College Sunrise ...	Jersey ...	12 June ,,	445	4·4	23·23	
Rosine	Ayrshire ...	19 Jan. ,,	446	4·4	23·23	
Mistress May ...	,, ...	3 Dec. ,,	571	3 6	22 80	
Hedges Dutchmaid	Holstein ...	26 May ,,	399	4·6	22·08	
College Grandeur	Jersey ...	29 Dec., 1920	380	4·8	21·88	
Thornton Fairetta	,, ...	15 Mar. ,,	322	5·8	21·71	
Miss Fearless ...	Ayrshire ...	26 May ,,	452	4·0	20·19	
Lady Loch II. ...	,, ...	31 Jan., 1922	451	4·0	20·15	
Comedienne ...	Jersey ...	26 Nov., 1920	387	4·4	20·06	
Leda's Jessie ...	,, ...	11 Jan., 1922	318	5·4	20·04	

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1922 AND 1921, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1922.	Feb., 1921.		Feb.	No. of Years' Records.	Feb., 1922	Feb., 1921.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	9·05	21	23·72	6·42	Nambour	8·34	26	21·26	3·93
Cairns	15·04	40	22·03	18·34	Nanango	4·26	40	2·66	0·86
Cardwell	16·60	50	41·29	10·34	Rockhampton ...	7·40	35	11·73	3·58
Cooktown	13·42	46	7·52	7·28	Woodford	8·67	35	11·51	1·34
Herberton	7·23	35	16·34	3·08					
Ingham	15·26	30	35 78	13 35					
Innisfail	21·51	41	44·09	20·29					
Mossman	15·01	14	23·54	14·25	*Darling Downs.*				
Townsville	11·61	51	13·31	1·38					
					Dalby	2·87	52	2·28	0·26
					Emu Vale	2·26	26	1·33	1·69
Central Coast.					Jimbour	2·83	34	2·23	0·14
					Miles	2·64	37	2·53	1·17
Ayr	8·82	35	9·18	0·99	Stanthorpe ...	3 31	49	1·41	1·97
Bowen	8·55	51	12·94	3·88	Toowoomba ...	4·31	50	4·63	1·71
Charters Towers ...	4·37	40	5·24	2·15	Warwick	3·12	57	1·77	1·71
Mackay	11·54	51	11·11	15·81					
Proserpine	10·58	19	19 53	15·25					
St. Lawrence ...	7·93	51	12·50	4·86	*Maranoa.*				
South Coast.					Roma	3·07	48	1·68	0·36
Biggenden	3·59	23	2·90	1·29					
Bundaberg	6·04	39	9·60	0 72	*State Farms, &c.*				
Brisbane	6·35	71	7·55	1·07					
Childers	5·77	27	8·17	0·62	Bungeworgorai ...	2·69	8	0·64	0·53
Crohamhurst ...	13·85	30	19·68	3·82	Gatton College ...	2·84	23	3·13	1·07
Esk	5·37	35	6·19	0·42	Gindie	2·68	23	8·96	0·44
Gayndah	4·09	51	1·85	0·88	Hermitage ...	2·35	16	1·71	1·50
Gympie	6·50	52	12·00	2·59	Kairi	6·70	8	26·49	6·65
Glasshouse M'tains	7·96	14	16·69	2·16	Sugar Experiment Station, Mackay	10·23	25	10·78	16·41
Kilkivan	4·94	43	4·92	2·04	Warren	3·93	8	7·32	0·93
Maryborough ...	6·40	51	7·25	2·00					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

General Notes.

THE SUGAR INDUSTRY.

ITS IMPORTANCE TO THE STATE.

THE PREMIER'S REVIEW.

In the course of a statement made on 16th March to the Press the Premier, the Hon. E. G. Theodore, reviewed the very important bearing the Southern agitation for the decontrol of the sugar industry has upon State and industrial interests. The statement related to the agenda of the annual meeting of the Associated Chambers of Commerce of the Commonwealth about to take place at Hobart, at which it was proposed to table motions urging the decontrol of the sugar industry, and was made with a view to acquainting the general public with the actual position of the industry and the attitude of the Queensland Government, which is a party to the existing agreement.

The Paramount Importance of the Sugar Industry.

The points made by the Premier in the course of his statement are epitomised as follows:—

The maintenance of the sugar industry and of its reasonable prosperity is of paramount importance to the State.

Canegrowing is Queensland's chief agricultural industry and the greatest wage-paying industry in the State.

Its maintenance is therefore one vitally affecting the industrial fabric of the State.

The Queensland Government will strongly resist by every legitimate means any action which would result not only in injury to the farmers, workers, and others concerned, but in retarding the settlement of tropical and subtropical regions of the State.

The interests of fruitgrowers run on parallel lines with those of sugar producers.

The big manufacturing interests in the Southern States are using the fruitgrowers as pawns in their game of self-advantage.

It is noteworthy that the Queensland fruitgrower does not join in the Southern chorus against the Queensland sugar industry, for the reason that he knows the real position and realises that his interests and those of the sugar producer are common.

It appears remarkable that, whilst there is so much publicity regarding the need for land settlement within the Commonwealth, there is at the same time such bitter hostility in the South towards the only industry which can settle our Northern littoral.

£15,000,000 Involved.

It may be safely said that not less than £15,000,000 is involved in the sugar industry.

The value of raw sugar manufactured in Australia last season approximated £9,000,000, of which £6,000,000 was disbursed in wages.

At present deflated prices, decontrol would entail sending over £6,000,000 annually out of Australia for black-grown importations.

From a White Australia point of view it should be realised that there are 25,000 persons directly engaged in the industry and many of the towns of North Queensland are actually dependent upon sugar.

Probably some 100,000 persons are directly or indirectly dependent upon the industry.

Decontrol would seriously affect the welfare of some 4,000 Southern seasonal workers and coastal shipping.

The War Value.

The industry is entitled to some recognition for its war value in supplying at controlled rates raw material for the large export trade in jams, preserved milk, and other commodities built up during the war.

Its Land Settlement Value.

£1,000,000 has been invested in new sugar mills in the North in recent years. £40,000 has been expended to date on the Maria Creek Returned Soldiers' Settlement, which is solely a canegrowing area.

The Herbert River and Johnstone River have, as a result of the growth of the sugar industry, increased their population by 15,000, the greatest proportionate increase in rural Australia.

Our Northern lands can be stabilised only by wise and far-seeing methods, and one such method is that of a continuance of Commonwealth control and a renewal of the sugar agreement.

With such an agreement there is no reason why sugar should not be retailed at a lower price without endangering settlement in the North, the rural population in the South, or the White Australia ideal.

The reasons governing the control of the sugar industry in 1915 exist with undiminished force to-day.

[Apropos of the foregoing the Congress of Associated Chambers of Commerce at Hobart carried a motion favouring decontrol of the sugar industry by the Federal Government, the voting being: For decontrol 24, against 20. The Queensland delegates fought hard for the retention of Government control.—ED.]

SHOW DATES, 1922.

Show society secretaries are invited to forward for insertion in this list dates of forthcoming shows. Alterations of dates should be notified without delay.

Toowoomba: 4th and 6th April.
Sydney Royal: 10th to 19th April.
Chinchilla: 11th and 12th April.
Herberton: 17 and 18th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Ascot: 22nd April.
Goondiwindi: 25th and 26th April.
Kingaroy: 26th and 27th April.

Longreach: 2nd and 3rd May.
Wondai: 3rd and 4th May.
Charleville: 3rd, 4th, and 5th May.
Toogoolawah: 4th and 5th May.
Grafton: 3rd to 6th May.
Blackall: 9th and 10th May.
Miriam Vale: 9th and 10th May.
Mitchell: 10th and 11th May.
Boonah: 10th and 11th May.
Murgon: 10th and 11th May.
Roma: 16th and 17th May.
Emerald: 17th and 18th May.
Kilkivan: 17th and 18th May.
Ipswich: 17th and 18th May.
Wallumbilla: 23rd and 24th May.
Maryborough: 23rd to 26th May.
Hughenden: 23rd and 24th May.
Springsure: 24th and 25th May.
Lowood: 25th and 26th May.
Childers and Beaudesert: 30th and 31st May.

Bundaberg: 1st to 3rd June.
Marburg: 2nd and 3rd June.
Brookfield: 3rd June.
Cairns: 7th and 8th June.
Gin Gin: 7th and 8th June.
Woombye N.C.A.H.S.: 7th and 8th June.
Mount Larcom: 9th and 10th June.
Gladstone: 15th and 16th June.
Rockhampton: 22nd, 23rd, and 24th June.
Esk: 28th and 29th June.
Mundubbera: 29th and 30th June.

Mackay: 30th June and 1st July.
Gayndah: 4th, 5th, and 6th July.
Nambour: 5th and 6th July.
Townsville: 5th and 6th July.
Charters Towers: 12th and 13th July.
Gatton: 12th and 13th July.
Proserpine: 13th, 14th, and 15th July.
Rosewood: 19th and 20th July.
Caboolture: 20th and 21st July.
Mount Gravatt: 22nd July.
Barcaldine: 25th and 26th July.
Crow's Nest: 26th July.
Pine Rivers: 28th and 29th July.
Wellington Point: 29th July.

Sandgate: 4th and 5th August.
Royal National: 7th to 12th August.
Belmont: 19th August.
Murrumbidgee: 22nd to 24th August.
Coorparoo: 26th August.
Kenilworth: 31st August.

Beenleigh: 1st and 2nd September.
Zillmere: 1st and 2nd September.
Gympie: 7th, 8th, and 9th September.
Wynnum: 9th September.
Imbil: 13th and 14th September.
Laidley: 13th and 14th September.
Sherwood: 16th September.
Rocklea: 23rd September.
Kilcoy: 28th and 29th September.

Esk Camp Drafting: 4th and 5th October.
Pomona, 4th and 5th October.
Southport: 6th October.
Enoggera: 7th October.

Farm and Garden Notes for May.

Field.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late maturing varieties should be in the ground by the middle of the month at the latest.

Cleveland, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. Growers are advised that all cotton in the Central District should be consigned to the Australian Cotton-growing Association, Rockhampton; whilst those in the Southern areas should consign their cotton to the Association at Whinstanes, Brisbane. All bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Kitchen Garden.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean and well-prepared ground. In favourable weather plant out cabbages, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots, and, where sufficiently large enough, thinned out. Dig and prepare beds for asparagus, using plenty of well-rotted farmyard manure.

Flower Garden.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE COAST DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become specked or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ in. in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply-cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. in diameter in a single layer.

Slowly acting manures—such as meatworks manures—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out in a droughty season.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt District, as late pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manures—such as Ground Island Phosphates or Basic Phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for the use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	APRIL.		MAY.		JUNE.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·2	5·50	6·18	5·20	6·36	5·3
2	6·3	5·49	6·18	5·19	6·36	5·3
3	6·3	5·48	6·19	5·18	6·37	5·3
4	6·4	5·47	6·20	5·17	6 37	5·3
5	6·5	5·45	6·21	5·17	6 38	5·2
6	6·5	5·44	6·22	5·16	6·38	5·2
7	6·6	5·43	6·22	5·16	6·39	5·2
8	6·6	5·42	6·23	5·15	6·39	5·2
9	6·7	5·41	6·23	5·14	6·40	5·2
10	6·7	5·40	6 24	5·14	6·40	5·2
11	6·8	5·39	6 25	5·13	6·41	5·2
12	6 8	5·38	6·25	5·13	6·41	5·2
13	6·9	5 37	6·26	5·12	6·42	5·2
14	6·9	5·36	6·26	5·12	6·42	5·2
15	6·10	5·35	6 27	5·11	6·42	5·3
16	6·10	5·34	6·27	5·10	6·42	5·3
17	6·11	5·33	6·28	5·10	6·42	5·3
18	6·11	5·32	6 28	5·9	6·43	5·3
19	6·12	5·31	6·29	5·9	6·43	5·4
20	6·12	5·30	6·29	5·8	6·43	5·4
21	6·13	5·29	6 30	5·8	6·43	5·4
22	6·13	5·28	6·31	5·7	6·43	5 4
23	6·14	5·27	6·31	5 7	6·43	5·4
24	6·14	5·26	6·32	5·6	6·44	5·4
25	6·15	5·25	6·32	5·6	6·44	5·4
26	6·15	5·24	6·33	5·5	6·44	5·5
27	6·16	5·23	6·33	5·5	6·44	5·5
28	6·16	5·22	6·34	5·4	6·44	5·5
29	6·17	5·22	6·34	5·4	6·44	5·5
30	6·17	5·21	6·35	5·3	6·44	5·6
31	...	...	6.35	...	...	...

PHASES OF THE MOON, OCCULTATIONS, &c

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer Time" is not used.

		H. M.
5 April	☾ First Quarter	3 46 p.m.
12 „	○ Full Moon	6 44 a.m.
19 „	☽ Last Quarter	10 54 a.m.
27 „	● New Moon	3 4 p.m.

Perigee on 10th at 6·36 p.m.
Apogee on 22nd at 8·12 p.m.

The moon will pass, apparently, close to Jupiter on the 11th soon after sunset. If viewed from a higher southern latitude the moon will be seen to occult the planet.

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4 May	☾ First Quarter	10 56 p.m.
11 „	○ Full Moon	4 6 p.m.
19 „	☽ Last Quarter	4 17 a.m.
27 „	● New Moon	4 4 a.m.

Perigee on 8th at 5·12 p.m.
Apogee on 20th at 2 30 p.m.

On the 8th, between 11 and 12 p.m., the moon will be again very near, apparently, to Jupiter in the constellation Virgo, with the very interesting binary star—Gamma Virginis—slightly below them.

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3 June	☾ First Quarter	4 10 a.m.
10 „	○ Full Moon	1 38 a.m.
17 „	☽ Last Quarter	10 3 p.m.
25 „	● New Moon	2 20 p.m

Perigee on 4th at 5·12 a.m. and on 29th at 1·24 p.m.
Apogee on 17th at 9·18 a.m.

The moon will pass Saturn on the 4th at a quarter past three in the afternoon, and will enable this planet to be seen in the daytime if a small telescope or binoculars are directed about six times the moon's diameter northward. It will also pass Jupiter on the 5th a little before four o'clock in the morning, again in apparent proximity to Gamma Virginis. Jupiter will again be occulted in high southern latitudes.

Venus, Jupiter, and Saturn will be evening stars during these three months. Mars will be somewhat later in rising, but will be visible early in the evening during the latter part of the period.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XVII. MAY, 1922. PART 5.

THE GERMINATION AND PURITY OF SEEDS SOLD IN MADE UP PACKETS.

BY F. F. COLEMAN, Expert under the Pure Seeds Acts.

Under the Pure Seeds Acts, the vendor of all seeds sold in made-up parcels is required to clearly and indelibly mark upon the outside of each packet *the year when the seeds were grown*. The buyer is thus able to make some discrimination in his purchases. It is well to remember that vegetable seeds differ from wine in that they are *not improved by age*.

All vegetable seeds offered for sale as seeds for sowing must comply with the Pure Seeds Acts as regards purity and germination. For the purposes of the Pure Seeds Acts, all impurities come under the definition of "Foreign Ingredients," which includes dead and non-germinable seeds, inert matter (such as dust, stones, or any material other than seeds), and seeds of weeds or seeds of any plant other than seeds of the kind to which the parcel or packet purports to belong. Diseased or insect-infested seeds are prohibited.

The following table gives the amount of dead and non-germinable seeds, inert matter, weed seeds, &c., that may be contained in the seeds mentioned:—

PROPORTION OR AMOUNT OF FOREIGN INGREDIENTS PRESCRIBED FOR VEGETABLE SEEDS.

Kind of Seeds.	Inert Matter.	Seeds of Weeds or Seeds of any kind other than that to which the sample purports to belong.	Diseased or insect-infested Seeds.	Dead and non-germinable Seeds.
	Per cent.	Per cent.	Per cent.	Per cent.
Asparagus	2	1	Nil	50
Beans	2	1	Nil	25
Beet	2	1	Nil	45*
Cucumber	2	1	Nil	30
Cabbage	2	1	Nil	35
Cauliflower	2	1	Nil	40
Carrot	2	1	Nil	45
Cress	2	1	Nil	40
Celery	2	1	Nil	50
Kohl Rabi	2	1	Nil	35
Lettuce	2	1	Nil	35
Leek	2	1	Nil	50
Marrow	2	1	Nil	30
Melon	2	1	Nil	35
Mustard	2	1	Nil	30
Marjoram	2	1	Nil	50
Onion	2	1	Nil	40
Peas	2	1	Nil	20
Parsnip	2	1	Nil	70
Parsley	2	1	Nil	50
Pumpkin	2	1	Nil	35
Radish	2	1	Nil	40
Swede	2	1	Nil	35
Sweet Corn	2	1	Nil	25
Spinach	2	1	Nil	50
Sage	2	1	Nil	50
Turnip	2	1	Nil	35
Tomato	2	1	Nil	35

* Non-germinable clusters.

INVOICE MUST BE GIVEN BY VENDOR.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

Subtropical and tropical climates are usually associated with high temperatures and excessive moisture, which gives rise to conditions causing rapid deterioration.

Experiments have proved that moisture is the chief factor in loss of germinating power. It is therefore essential that both buyers and sellers should store all seeds under the driest and coolest possible conditions.

Before putting any seeds up in pockets, it is advisable to dry them for a few days at a slightly higher temperature than that to which they will be submitted during subsequent storage. If this is not done, any rise in temperature above that of the place where the seeds were packed will liberate moisture within the packet and cause deterioration.

Although the life of a seed is undoubtedly dependent on many causes, the most important factor governing the storage of seeds without excessive loss of vitality is dryness.

Should the vendor of any seeds have a complaint regarding their purity or germination, it is advisable to at once send samples of the seeds in question to the Department of Agriculture. Three unopened packets of vegetable seeds is the quantity required for a sample of seeds in made-up parcels. The vendors' fee for analysis is 2s. 6d. per sample. A vendor is—

> "Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds."

FREE ANALYSIS.

No charge is made to persons sending in samples of any vegetable seeds purchased by them for their own sowing, providing the following particulars are plainly written on each sample:—

Vendor's name and address.
Name of seed.
Quantity purchased.
Date of delivery.
Locality where seed is to be sown.
Name and address of purchaser.

All samples with *covering letter*, should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

COMBAT AND CONTROL OF CANE PESTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, dated 9th March, 1922, from the Entomologist (Mr. E. Jarvis):—

"Intense heat during the month of February, accompanied by abundant rain at intervals, has somewhat interfered with outside work; but, on the whole, laboratory experiments give promise of success in the field later on. As already pointed out in 1915 ("Queensland Agricultural Journal," vol. iii., p. 220), one of the best forms of control against the grub stage consists (in the writer's opinion) of the application to cane sets or furrows, at planting time, of some inexpensive deterrent sufficiently obnoxious and durable to protect a limited area containing the main roots from invasion during most of the growing period.

"Another promising remedy is fumigation of the soil with some gas that, while deadly to animal life, is harmless to cane plants, and possesses, if possible, a manurial value.

"Fumigation with carbon bisulphide, for instance, would come under the latter remedial method, and therefore some attention has been given during the last couple of months to field experimentation with this well-known fumigant. With regard to the former method of control by means of obnoxious repellants, this matter is being closely studied, several chemical preparations having been tested up to the present

with varying measures of success. We are working towards the discovery of a substance possessing an odour of such durability as to allow of its influence being exercised in the soil throughout a period of three months or longer. If put into the drills along with cane sets when planting, say in September, a substance of this nature would have time to render the soil around cane-stools sufficiently disagreeable to probably act as a repellant to beetles entering the field to oviposit during November or December.

"One of the preparations being tested here at present, and consisting of a combination of certain chemicals, is not only repellant, but possesses the additional advantage of being fatal to animal life. Grubs confined in cages holding about 40 cub. in. of soil that had been treated with a small injection of this chemical substance were found to be semi-paralysed after forty-eight hours, and died in from three to five days. Under field conditions, however, we must expect to meet with many obstacles in the way of success, some of which, if found to be insurmountable, might necessitate a modification or even the abandonment of a particular line of research.

"POISON BAITS FOR CANE-GRUBS.

"Now that grubs are becoming plentiful, we intend to further investigate the possibilities ahead of this phase of cane-grub control. The only previous attempt in a similar direction was made in 1916, an account of which is given in Bulletin No. 4 of our Division of Entomology. At the time this was published, arsenate of copper (Paris green) was discovered to be more deadly than white arsenic. Cowpea leaves dusted with the former arsenical were readily devoured by grubs of the grey-back beetle, and proved fatal to about 58 per cent. after one week, 75 per cent. after fifteen days, and 100 per cent. after the lapse of twenty-five days.

"These results, which were obtained in cages at the laboratory, were thought sufficiently conclusive to warrant preliminary field tests. The matter, however, was never fully investigated, and of late years the evident claims of this arsenical were set aside in favour of white arsenic, which, although cheaper, is less effective. The recent failure of various test-plots treated with white arsenic in canefields around Meringa should, I think, be attributed mainly to the methods of application adopted. In the writer's opinion, white arsenic applied loosely in the drills in even greater quantities than 200 lb. per acre would not prove effective against cane-grubs, for the simple reason that, when chancing to ingest a portion of such treated soil, the amount swallowed would often contain only a mere fraction of the arsenical; moreover, each shower of rain would tend to wash the minute particles of arsenic downwards, thereby causing additional and far greater adulteration with the soil. Thus it becomes imperative, if we would secure good results, to administer the poison in as concentrated a form as possible; and with this end in view, we are studying the effects upon cane-grubs of various methods of placing the bait. Later on, during the planting season, the more promising of these methods will be tested by means of experiment plots in the field.

"RANGE OF FLIGHT OF THE CANE-BEETLE.

"The topographical conditions of the country around Gordonvale probably play an important part in the distribution of this formidable cane-beetle, and, in the writer's opinion, may even be responsible for its occurrence in overwhelming numbers on certain restricted areas.

"We know that in many kinds of insects migration of the adult form often becomes necessary to the persistence of a species, and may at times lead to its excessive increase. Our canebeetle, for example, when chancing to occur in exceptional quantities over a small area, does not, I think, remain and breed there, unless imprisoned, as it were, by mountain ranges lying to leeward of the trade wind, knowing instinctively the many dangers that threaten crowded numbers; but generally migrates, if possible, in order to distribute its eggs more widely and establish the grubs in a varied assortment of soils, thereby reducing the percentage of mortality caused by parasitic and predaceous foes. Many strongly-winged insects enjoy a very extended range of flight, certain grasshoppers, butterflies, and moths affording familiar examples.

"Weakly fliers, on the other hand, including the beetle under consideration, are forced to rely chiefly on the wind as a means of transport, the measure of success achieved by a species being dependent, of course, on its size, strength, and degree of buoyancy.

"The grey-back cockchafer, which is about 1¼ in. long and of somewhat bulky proportions, would seem, at first sight, quite unfitted for extended aerial transportation; but while studying the anatomy of this insect in 1916, I was surprised to discover that related scarabacidæ of smaller size were heavier than this species.

"It has been estimated that one pound of grey-back beetles represents about 216 specimens; so that, in spite of its bulk, a single individual would weigh, on an average, only 2 scruples—viz., the weight of an ordinary wine-cork.

"The so-called 'Christmas Beetle' (*Anoplognathus boisduvali*), an insect scarcely half as big, proved slightly heavier; while a rutelid beetle (*Calvodes grayanus*), although not three-quarters the size of albohirtum, turned the scale at about 2½ scruples. These differences in weight, which were determined from living specimens, are due to variations in the consistency of the harder portions of the body known as the other skeleton, which in the grey-back cockchafer are so thin as to be almost leathery in texture, but in *boisduvali* and *grayanus* are comparatively thick and horny.

"As a general rule, weakly flight, coupled with large size, tends to retard the spread of moderately heavy insects, but where such drawbacks are associated with unusual bouyancy, they are likely to aid rather than hinder rapid distribution, especially when, as in the present instance, bulk is accompanied by a proportionate expanse of wing. In short, it appears likely that the dispersion of our cane-beetle and its occurrence locally in concentrated numbers should be attributed primarily to influences of a meteorological nature, operating in conjunction with such factors as the mechanical condition of soils, character and disposition of timber, and, more especially, the geographical situation of the higher lands and mountain ranges."

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MARCH, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Gay Lassie ...	Ayrshire ...	20 Feb., 1922	1,244	5·0	73·43	
Prim	Holstein ...	9 Feb. ,,	1,152	3·8	64·69	
Snowflake	Shorthorn...	20 Feb. ,,	1,041	5·2	63·95	
Little Buttercup...	Holstein ...	12 Dec., 1921	1,107	4·6	60·00	
Auntie's Lass ...	Ayrshire ...	31 Oct. ,,	969	4·2	47·83	
Lute	,, ...	8 Jan., 1922	1,073	3·8	47·81	
College Ma Petite	Jersey ...	5 Feb. ,,	775	5·2	47·10	
College Cold Iron	,, ..	25 Jan. ,,	785	5·0	46·32	
Thyra of Myrtle-view	Ayrshire ..	31 July, 1921	823	4·4	42·62	
Magnet's Leda ...	Jersey ..	8 Feb., 1922	878	4·0	41·29	
Skylark	Ayrshire ...	7 Feb. ,,	954	3·6	40·24	
Lady Annette ...	,, ...	2 Jan. ,,	737	4·6	39·94	
Lilia	,, ...	3 Mar. ,,	797	4·2	39·34	
Hedges Madge ...	Holstein ...	15 Aug., 1921	832	4·0	39·08	
Lady Mitchell ...	,, ...	20 Dec. ,,	676	4·6	36·62	
Buttercup	Shorthorn...	28 Oct. ,,	968	3·2	36·13	
College St. Margaret	Jersey ...	25 Sept. ,,	580	5·2	35·62	
College Wildflower	,, ..	10 Dec. ,,	572	5·2	35·12	
College Bluebell ...	,, ...	22 Oct. ,,	696	4·2	34·35	
Glow VI.	Guernsey ...	28 Aug. ,,	528	5·4	33·70	
College Mignon ...	Jersey ...	7 July ,,	622	4·2	30·70	
Lady Meg ...	Ayrshire ...	25 Jan. ,,	727	3·6	30·66	
College Evening Glow	Jersey ...	10 Oct. ,,	639	4·0	30 00	
Iron Plate... ...	,, ...	12 July ,,	746	3·2	27·84	
College Nita ...	Holstein ...	26 Feb., 1922	694	3·4	27·56	
Miss Security ...	Ayrshire ...	20 Aug., 1921	649	3·6	27·36	
Lady Loch II. ...	,, ...	31 Jan., 1922	525	4·4	27·19	
College Prima Donna	Holstein ...	17 Nov., 1921	680	3·4	27 01	
Bellona	Ayrshire ...	26 June ,,	559	4·0	26·25	
College Sunrise ...	Jersey ...	12 June ,,	410	5·2	25·18	
Nina	Shorthorn...	11 Nov. ,,	595	3 6	25·10	
Miss Betty ...	Jersey ...	7 July ,,	470	4·4	24·34	
Netherton Belle ...	Ayrshire ...	30 Nov., 1920	398	5·0	23·48	
Miss Saffron ..	,, ...	20 Feb., 1922	540	3·6	22 78	
Mistress May ...	,, ...	3 Dec., 1921	511	3·8	22·77	
Yarraview Snowdrop	Guernsey ...	14 Oct. ,,	398	4·8	22·49	
Comedienne ...	Jersey ...	26 Nov., 1920	352	5·4	22·44	
College Promise ...	,, ..	6 Jan., 1922	543	3·4	21·57	
Yarraview Village Belle	Guernsey ...	6 Aug., 1921	315	5·6	20·86	
Songstress	Ayrshire ...	4 Mar. ,,	319	5·4	20·36	
College Desire ...	,, ...	16 Nov. ,,	376	4·6	20·36	

A SUMMARY OF SOME EXPERIMENTS CONDUCTED WITH SUGAR CANE BY THE BUREAU OF SUGAR EXPERIMENT STATIONS SINCE 1902.—I.

By H. T. EASTERBY, General Superintendent.

Last year (1921) the Bureau of Sugar Experiment Stations completed its twenty-first year of existence. In the course of that period a large number of experiments in cultivation, fertilisation, irrigation, and general husbandry of the sugar-cane plant have been carried out, the results of which are embodied in the twenty-one annual reports of the Bureau. It is recognised that it is an arduous task to wade through twenty-one reports to get at the results of any experiment, and it has been determined to issue a summary of the principal experiments made. This will subsequently be published in bulletin form, together with a summary of the chemical work carried out by the Bureau, mainly in connection with soils, which will be prepared by Mr. George Patten, formerly attached to the Bureau of Sugar Experiment Stations as First Assistant Chemist, but latterly with the Agricultural Laboratory.

DEEP CULTIVATION EXPERIMENTS.

The first experiments were undertaken at the Sugar Experiment Station at Mackay (the soil of which is alluvial and of fair average quality compared with the rest of the district) in order to demonstrate the necessity for, and primary value of, thorough deep subsoil cultivation, it being considered that in alluvial soils such methods of cultivation must precede all other methods for increasing production.

The mode of treatment included:—

1. Breaking up and turning over the land with a swing plough to a depth of not less than 12 inches.

2. The thorough stirring of the subsoil by a subsoil plough to a further depth of 6 to 8 inches, furnishing thus a loose mass of soil 18 to 20 inches in depth. This was later on followed by cross ploughings, the number of ploughings given, exclusive of breaking up, being four.

The experiment also included a similar piece of land of uniform depth and character and part of the same field. This received the treatment usually accorded to land by farmers in the Mackay district, and was a comparison plot.

The land on which the experiments were made was all in one piece and strictly uniform in depth of soil and other characteristics and had not borne crops for some considerable time.

Planting was done at the beginning of April, 1902, the variety of cane used being Rose Bamboo, or Rappoe. The cane was cut into plants having three eyes and laid in drills 5 ft. apart, the distance between the ends of the cane in the drill being 6 in. The cane was covered with 3½ in. of soil. Germination took place in about ten days.

Subsequent cultivation was of a shallow nature not exceeding 3 in. in depth, and was done by the Planet Junior fitted with broad duck-foot hoes. This method is one strongly to be recommended, particularly in dry seasons. Professor King has repeatedly pointed out the efficacy of dry earth mulches in the conservation of soil moisture. Scientific authorities all over the world recommend this cultivation to be so done as to leave a level mulch of soil upon the top, after cutting through the capillary tubes that are leading moisture to the surface. Its importance through a dry period cannot possibly be over-estimated. In his work on soils, Hilgard says:—"The loose tilth of the surface, which is so conducive to the rapid absorption of the surface water, is also, broadly speaking, the best means of reducing evaporation to the lowest possible point. . . . It is true that relatively coarse compound particles are incapable of withdrawing capillary moisture from the dense soil or subsoil underneath, just as a dry sponge is incapable of absorbing any moisture from a wet brick, while a dry brick will readily withdraw nearly all the water contained in the relatively large pores of the sponge. A layer of loose, dry surface soil is therefore an excellent preventive of evaporation and to moderate the access of excessive heat and dryness to the active roots."

During the first eight months of the life of the cane the weather was dry and rainless, the year being the drought year of 1902, but the method of cultivation adopted kept the cane alive till good rain fell in December, which was followed by favourable weather in 1903, when a splendid growth took place and continued.

No fertiliser or irrigation water was applied to either of these experiments.

At the age of eighteen months the cane was harvested, with the following results:—

YIELD OF CANE AND SUGAR PER ACRE FROM SUBSOILED AND NON-SUBSOILED PLOTS.

Method of Cultivation.	Weight of Cane per Acre. English tons.	Weight of Sugar per Acre. English tons.
Deep subsoil cultivation	49·3	6·7
Ordinary cultivation	29·5	3·9

Difference = 19.8 tons per acre.

From a large number of analyses of soils in the Mackay district it has been shown that most of the soils in that district are fair, and some are very high, in total content of lime. This element, however, is in a very insoluble and inactive state. Deep and very thorough cultivation and exposure of the largest possible mass of soil to the air and sun are the most effective means of bringing these large amounts of lime into an available state. In potash, nitrogen, and phosphoric acid the Mackay soils are generally very low.

The cane grown by the deep subsoil and thorough cultivation had higher sucrose, higher purity, lower glucose, and a notably less content of fibre, thus resulting in a higher total amount of obtainable sugar in the cane than the cane grown by "ordinary cultivation." The higher fibre content of the latter is due to the thinner sticks and shorter joints.

Further subsoiling experiments were carried out with ratoon crops from 1905 to 1907. In one series all the ground between the rows was ploughed and subsoiled, while in the other the ground between the rows was simply ploughed to a depth of 8 in. These experiments were carried on over the first, second, and third ratoon crops, and with the exception of the subsoiling all other acts of cultivation were identical. The results from the three crops of ratoons were as under:—

Crops.	Yield of Cane per acre where the ground between the rows was ploughed and sub-soiled. English tons.	Yield of Cane per acre where the ground between the rows was only ploughed to eight inches. English tons.
First ratoons	38·9	27·0
Second ratoons	31·3	19·2
Third ratoons	20·4	9·91

These experiments were not fertilised or irrigated.

Further experiments were again made at Mackay with subsoiling, in 1919, which were carried out in the following manner:—

> Uniform land was divided into two pieces, the whole being cross-ploughed four times to 12 in., while one-half received a subsoiling with the special implement known as the subsoiler to a further depth of 7 in., making 19 in. in all. The other treatment of the whole of the land was identical. The cane used for plants was Green Goru, or N.G.24B. This crop was planted in April of 1919, and the difference between the subsoiled and unsubsoiled plots was well marked during the whole period of growth in the plant crop and also in the first ratoons.

PLATE 44.—SUGAR LABORATORY, MACKAY.

Below are given the results of the plant and first ratoon crops:—

CROP RESULTS OF SUBSOILING EXPERIMENT—PLANT AND FIRST RATOON CROP. VARIETY, GREEN GORU (N.G.24B).

Plot.	Treatment.	Plant Crop, 1920.			First Ratoon Crop, 1921.		
		Age of Cane.	Yield of Cane per Acre in English tons.	Yield of Commercial Cane Sugar in English tons.	Age of Cane.	Yield of Cane per Acre in English tons.	Yield of Commercial Cane Sugar per Acre in English tons.
1	Plant Crop subsoiled and Ratoon Crop also subsoiled	17 months	37·1	5·15	12 months	35·8	5·35
2	Plant Crop not sub soiled, and succeeding Crop ratooned by plough ng 9 in. deep	,,	28·5	3·85	,,	29·9	4·48

Difference in favour of subsoiling on two crops—14.5 tons of cane and 2.17 tons of commercial cane sugar per acre.

Due to the large amount of working that the ordinary or farmer's plot received, the results for this are also good. In ordinary practice it is doubtful if all farmers cross-plough four times to 12 in. deep and thoroughly ratoon to 9 in.

Subsoiling experiments upon the open, porous, red soils of Bundaberg and Isis have never given payable results, so that, as far as the Bureau's experience goes, subsoiling is not recommended on these soils. Upon alluvial soils, and those with clay subsoils, the thorough deep subsoil cultivation pays handsomely.

THE GINDI BEEF SHORTHORN STUD AND HERD.

By H. P. BURNAGE, Manager.

PRESENT CONDITION OF THE CATTLE INDUSTRY.

The cattlemen of this State are feeling the aftermath of the war more than any other primary-producing section of the community. The present parlous condition of the beef industry, brought about by an unprecedented drop in the price of cattle, representing over several millions sterling in the course of comparatively only a matter of months, and the closing down simultaneously of the export market, are circumstances which, when examined from the aspect of cause and effect, are calculated to bring about an inevitable depreciation in the quality and type of the cattle throughout the State, unless concerted action is taken to prevent it.

QUEENSLAND'S LARGE HERDS.

Queensland, with its 6,500,000 cattle and its extensive meatworks in different parts of the State, was eulogised generally during the war for playing its part in contributing a large quota of meat for the troops overseas at a much lower price than that paid for meat purchased elsewhere by the British Government.

Concurrently with the demand for cattle for slaughtering purposes, there was an immediate occasion for the use of bulls which would effect what every cattleman worthy of the name was aiming at—early maturity and improved quality.

PLATE 45.—GINDIE STATE FARM (BEEF SHORTHORN STUD FARM), GENERAL VIEW.

THE NEED FOR IMPROVING AND MAINTAINING QUALITY.

The breeding of stud and herd bulls naturally became a very profitable occupation to those who could cater for the demand for animals possessing the characteristics and prepotency desired.

To-day, owing to the unprecedented slump in values of bulls, in keeping with other classes of stock, there is every likelihood of many breeders of high-class cattle reducing their herds, for the simple reason that station-owners will naturally be obliged to curtail their usual orders for herd bulls owing to stress of circumstances. Although this economic factor cannot be ignored, there are sound reasons for deprecating action which will have a tendency to bring about any depreciation in the quality of the stock about to be bred.

THE ARGENTINE AS A COMPETITOR IN THE WORLD'S MEAT MARKETS.

Whilst a crisis such as the cattle industry is suffering from has to be faced, it is obvious that consideration should be given to what is being effected by our more fortunately situated competitor in the meat trade—the Argentine.

Queensland in the first place has to "freeze" its beef as against the Argentine "chilling" it. Although our natural pastures are admittedly the finest in the world, we are handicapped to some extent by the fact that the Argentine fattens its cattle on alfalfa (lucerne), a food rich in protein (flesh-forming) substances, and where the fields under this crop stretch to an almost illimitable horizon. Immediately on top of these favourable conditions, one must give the Argentine cattle ranchmen the credit for their foresight in purchasing the highest priced stud stock bred in the United Kingdom.

PLATE 46.—ALBANY DUKE OF BEAUFORT 20TH (161 S.H.B. of Q.)
A typical Sire to use for producing early maturing Stock.

WHAT QUEENSLAND CATTLEMEN SHOULD AIM AT.

Queensland's immediate objective should be directed towards herd improvement, the production of deep, evenly fleshed, early maturing, weighty steers, which could be marketed at from two and a-half to three years old—animals which can only be produced by using pure-bred prepotent beef bulls capable, when used with suitable cows, of transmitting characteristics which may be summed up in the one word "quality."

Plate 47.—Gindie Duke of Beaufort 2nd, 375 (S.H.B. of Q.) Age 22 Months.
A Promising young Sire of good conformation, type, and early maturing quality.

Plate 48.—Yandilla Cherry Duke (314 S.H.B. of Q.), and portion of far-famed Belltrees Heifers used for production of early maturing qualities for Herd improvement.

THE GINDIE STUD AND HERD.

OBJECTS.

The formation of this stud and herd was entrusted to the present management by the Department of Agriculture and Stock in 1914, and was established for the purpose of serving the interests of graziers and selectors in Central Queensland, who would have the means readily at hand of building up their herds and, incidentally, of improving the type and quality of the cattle in the district.

VALUE OF INOCULATED CATTLE.

Being in ticky country, care is taken to keep up the toleration to ticks by inoculation with blood from prepared and tested bleeders; consequently, bulls may be taken on to the coastal or intercoastal country without fear of any ill effects or consequences.

AREA OF FARM AND CLASS OF COUNTRY.

The farm, upwards of 10,000 acres in area, is watered by the Nogoa River, and by bores and windmills, and comprises a good balance between rich downs and river country, with an appreciable area of scrub and timbered lands; a portion of the latter is sand-ridge, where the natural feed comes away very quickly after rain.

PLATE 49.—GRASS COUNTRY.

GRASS AND HERBAGE.

The average rainfall amounts to approximately 23 in. per annum, and by far the heaviest falls are experienced in the summer months. The district, of which the farm forms a small part, enjoys an excellent reputation for the natural wealth and richness of its grasses and herbage. Mitchell, Flinders, Panic, Blue Grass, Couch, Eriochloa (Early Spring), Sago Grass, and many other popular kinds are met with, according to their natural habitat. The resting of paddocks is practised to give the grasses a chance to re-seed themselves. As many of the Chloris family naturally thrive well, attention has been given to the introduction of Rhodes grass to provide a variety of pasture. In most seasons Chenopodium (fat hen) obtrudes itself for a time, and makes an excellent standby at certain periods between the herbage and grass seasons.

FODDER SUPPLIES.

The practice of stabling and paddocking bulls between the respective breeding seasons, and the general requirements at other periods in the way of fodder for young bulls and stud animals, calls for ample supplies of both hay and ensilage.

Cultivation is maintained over a sufficient area of land to provide summer-growing fodders for filling the twin reinforced-concrete silos. Wheat and oats are grown as hay crops, and barley as a green fodder and grazing crop.

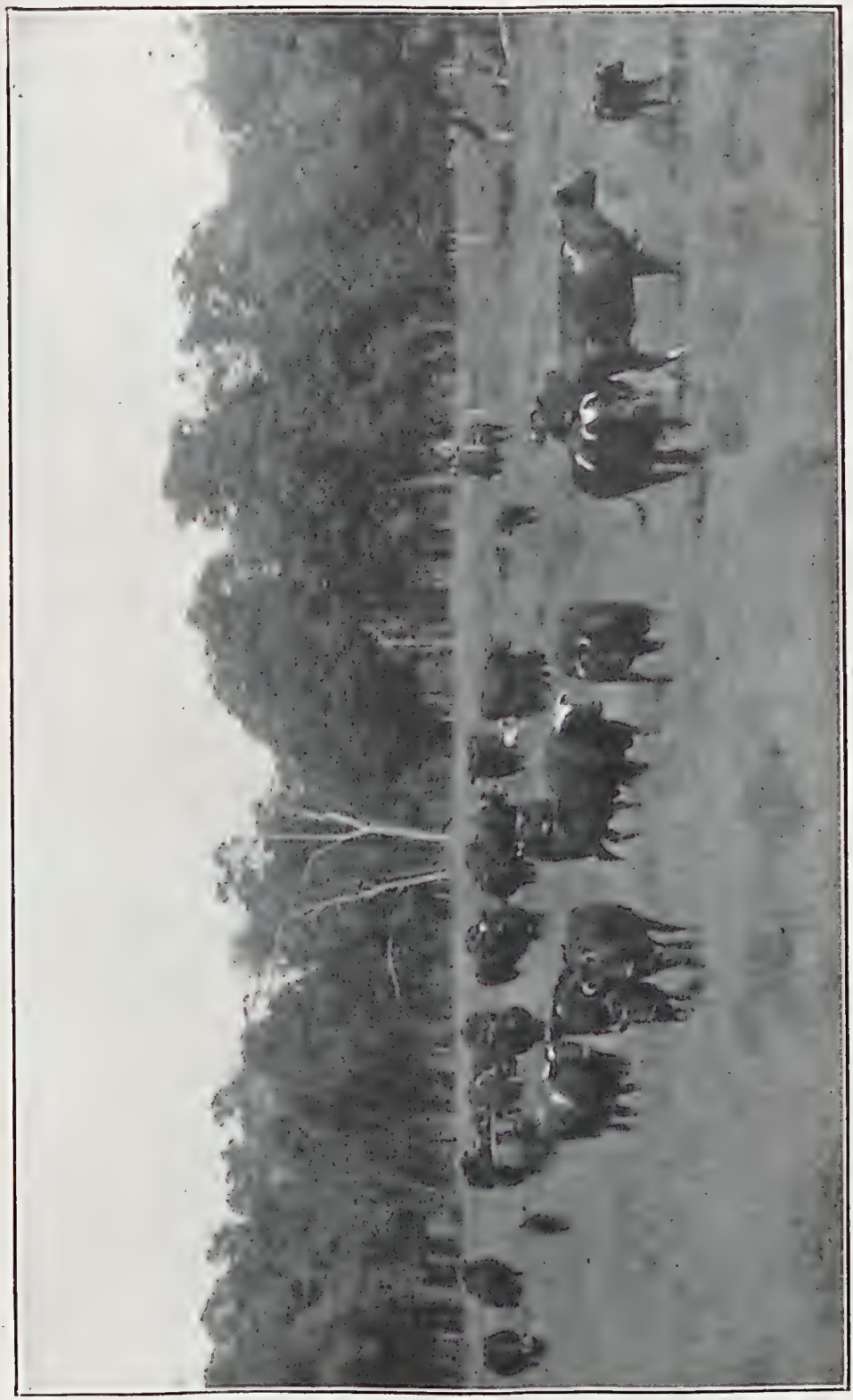

Plate 50.—One of the Family Groups.
Bred and mated with Albany Duke of Beaufort 20th (161 S.H.B. of Q.)

BREEDING SYSTEMS.

The stock are classed throughout into stud and family herd groups, with due regard to the mating of certain lines of blood calculated to keep up and improve the desired standard of type and conformation. A rigid system of selection is followed, both for females and males, in order that constitution and quality may be aimed at and maintained. By this means it is possible to ensure that not only are the sires sent out of undoubted purity, but they can be relied upon to perpetuate and project in their progeny that ascendency of food feeding and early maturing qualities which count for so much in the animal bred for a specific purpose.

The universal adoption of maxims of this character by Queensland cattlemen, and putting them consistently into practice, will soon place the beef industry of the State on a sound footing, and enable the State to compete successfully in the world's markets.

FOUNDATION STOCK.

The animals throughout are good rich colours, reds and roans.

The females chosen for this purpose were—two imported Coates Herd Book heifers; three from the stud of Mr. J. H. Angas, of Collingrove, South Australia; two from Mr. J. Williamson's stud, Lockinver, Victoria; and 175 high-class heifers selected from the far-famed Belltrees herd owned by Messrs. H. E. A. and V. White, of Scone, New South Wales.

The bulls selected comprise the following:—Shenley Marco (imp.) (159 S.H.B. of Q.), Albany Duke of Beaufort 20th (161 S.H.B. of Q.), Lyndhurst Royal Peer 15th (163 S.H.B. of Q.), Beau Blanche 41st (164 S.H.B. of Q.), Grand Duke of Oxford 56th (376 S.H.B. of Q.), Yandilla Cherry Duke (314 S.H.B. of Q.), Yandilla Cherry Duke 3rd (311 S.H.B. of Q.), Wongan Duke of Derrimut (160 S.H.B. of Q.).

Since the inception of the stud some very fine cattle have been bred; numerous prizes have been taken at shows, and the demand for young stock has been consistent. Care is taken to send out only animals for herd improvement which possess constitution, type, and quality.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

DILLENIA INDICA.

NATURAL ORDER DILLENIACEÆ.

BY E. W. BICK, Curator Botanic Gardens.

Derivation.—(B.M. T.5016. 1857.) *Dillenia*, named by Linnæus in honour of John James Dillenius, a former Professor of Botany at Oxford, "because it is of all plants the most distinguished for the beauty of its flower and fruits, like Dillenius amongst botanists" (Critica Botanica, p. 80). The specific name indica was also given by Linnæus; Thunberg called it *Dillenia speciosa;* following Index Kewensis, it is here given as *Dillenia indica.*

Description.—A good-sized tree, up to 40 ft. in height, with a short, erect, bulky trunk, branches spreading into a broad, rounded head, bark of trunk and larger branches about ¼ in. thick, coarse and brittle, internally reddish brown, outer surface grey, shining, rugose, with many small cracks and scales. Leaves very ornamental in appearance, oblong lanceolate, 6 to 12 in. in length, deeply and sharply serrate, with numerous parallel stout ribs, ending in the points of the serratures, coriaceous when old. Petioles 1 to 1½ in. long, channelled.

Flowers.—Large, from 6 to 8 in. in diameter, solitary, borne on slightly curved peduncles, among the terminal leaves, bringing the very large delightfully fragrant flower into an oblique position. Calyx of five, very large, concave, pale green, thick, and fleshy sepals, thin and membraneous at the edge, enlarging with the fruit, which they permanently enclose. Petals five, 3 in. long, obovate, cuneate, white, concave in the upper portion, obscurely veined, and slightly waved. Stamens numerous, forming a dense compact mass around pistil, which they entirely conceal except for the stigmas, or, as Roxburgh expresses it, "forming a large yellow globe in the centre, which is elegantly crowned with the white, lanceolate, spreading rays of the stigma." Filaments short, white; anthers linear, yellow; ovaries 15 to 20; ovules minute; styles, as many as ovaries. Fruit compressed, consisting of the numerous subreniform capsules attached to the fleshy central mass that contains a clear glutinous liquid, which surrounds the seeds. The fruit are from 5 to 7 in. in diameter; the fleshy calyx is eaten either raw or cooked by the natives in their curries and chutneys, having an agreeable acid flavour not unlike rhubarb.

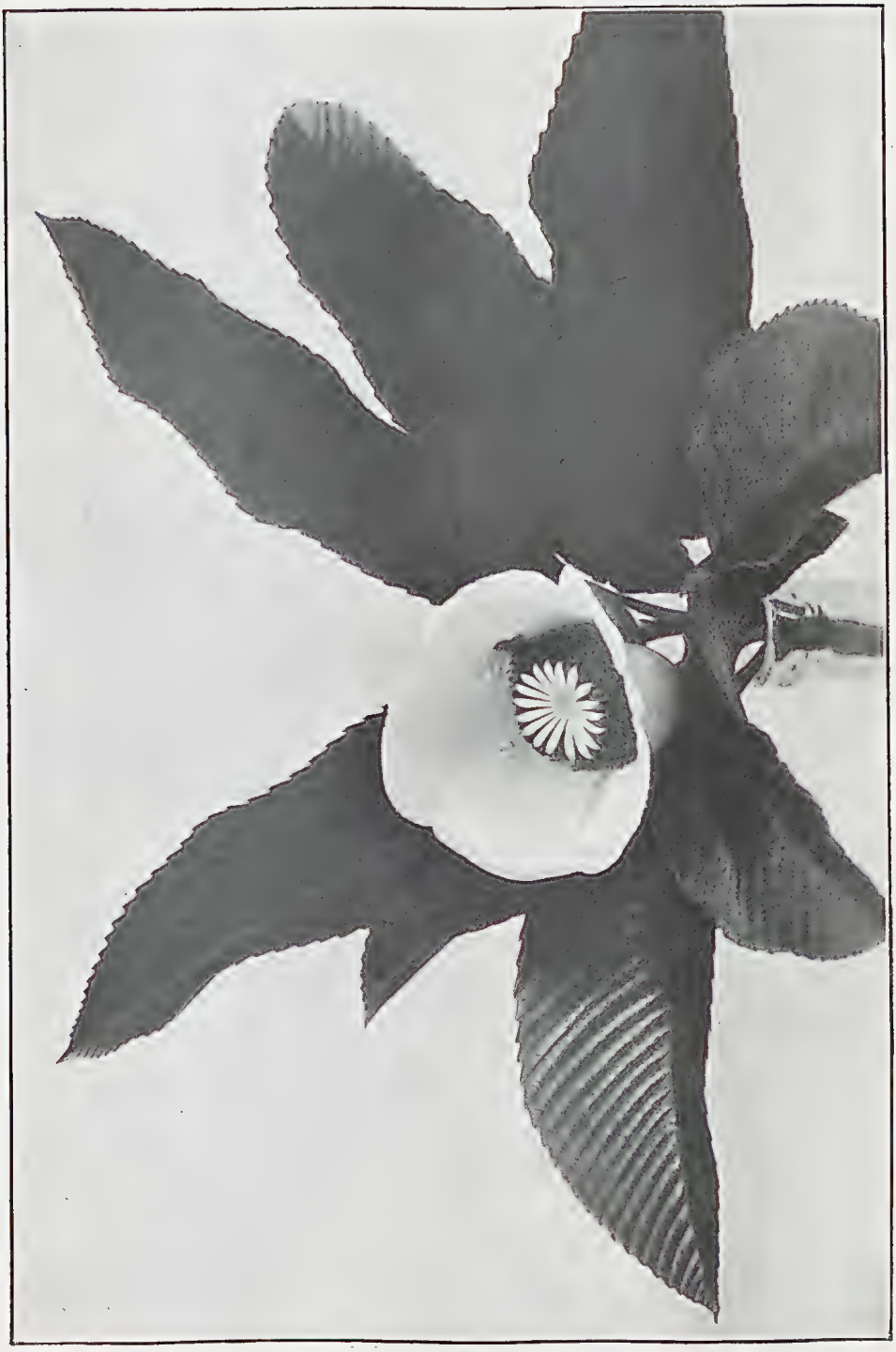

PLATE 51.—DILLENIA INDICA.

Timber.—Sapwood white, heartwood light brown or pinkish, close and smooth grained, hard and tough, used in India for gun stocks and in boat building, and is said to be very durable under water (Brandis Forest Flora, p. 2).

Propagation.—From seed; the seeds are small and somewhat difficult to remove from the fruit, the outer calyx being tough; the young seedlings grow quickly, and the tree thrives best in a moist situation.

A very fine specimen grew in the Acclimatisation Society's grounds at Bowen Park some years ago, from which hundreds of young plants were propagated and distributed, chiefly to Northern Queensland; unfortunately, the old tree at Bowen Park died a year or two ago. A large specimen in the Botanic Gardens was killed by the 1893 flood, but a young tree between the Botanic Museum and kiosk is now flowering freely.

Habitat.—One of the handsomest of Indian trees, whether the beautiful foliage is considered or the size and structure of the flowers. It is largely cultivated by the natives throughout India, particularly about temples. It is indigenous along the base of the Himalayas, from Nepal to Assam, in Bengal, South India, Ceylon, Burmah, and the Malayan Peninsula.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 10.

SOCKET WOOD (Daphnandra micrantha).

Common Name.—Socket Wood (the branches when broken at the joints often show a ball-and-socket-like fracture).

Derivation.—Gk. *daphne,* the laurel or bay tree; *aner, andros,* a man (probably alluding to the anthers being like those of a daphne); micrantha from Gk. *mikros,* small; *anthos,* a flower.

Description.—A large tree, attaining a height of about 120 ft. and a barrel diameter of over 2 ft. Barrel sometimes slightly flanged at the base. Bark grey, often rough with small warts; when cut, yellow with a thin brown outermost layer; thickness of bark, ½ in. on a tree with a barrel diameter of 2 ft. 3 in. Sapwood light yellow. Older leaves and branchlets hairless, young shoots often downy. Leaf stalks ⅛ to ¼ in. long. Leaves opposite, elliptical, rather narrowed at the base, protracted into a fairly long point at the apex, margins coarsely toothed, lateral nerves and net veins more conspicuous on the underside; measurement of leaf blade, 2 to 4 in. long, two and two-thirds to four times as long as broad. Flowers in small bunches (panicles) in the forks of the leaves or at the scars of fallen leaves, the bunches much shorter than the leaves. Stalks of individual flowers short. Individual flowers measuring about 3/10 in. in diameter when expanded. The outer part of the flower consists of 10 to 15 (11 to 12 in specimens we examined) perianth segments, the outer ones shorter than the inner ones. On the inside of the perianth segments, and shorter than them, are five stamens. On the inside of the stamens are six or more minute hairy staminodia (modified stamens) surrounding several finely hairy bristle-like carpels (female organs). Fruit consisting of the lower part of the perianth enclosing the mature carpels, narrowly egg-shaped or almost cylindrical, often oblique, ½ to 1 in. long; carpels very slender, covered with fine brown hairs attaining ¼ in. in length. Flowering period, October; in fruit in January.

Distribution.—Confined to Australia. Common in the scrubs of the Killarney Ranges, National Park, Macpherson Range, Tambourine Mountain. It was also common in the scrubs about Brisbane. Amamoor and Imbil, in the Gympie District, are our northernmost records. As far south as the Hunter River, N.S.W. (J. H. Maiden).

Uses.—The timber could be used for general indoor and cabinet work.

References.—Daphnandra micrantha, Bentham, "Flora Australiensis," vol. v., p. 285; F. M. Bailey, "Queensland Flora," part iv., 1295; R. T. Baker, "Hardwoods of Australia," p. 332; J. H. Maiden, "Forest Flora of N.S.W.," vol. vii., p. 368.

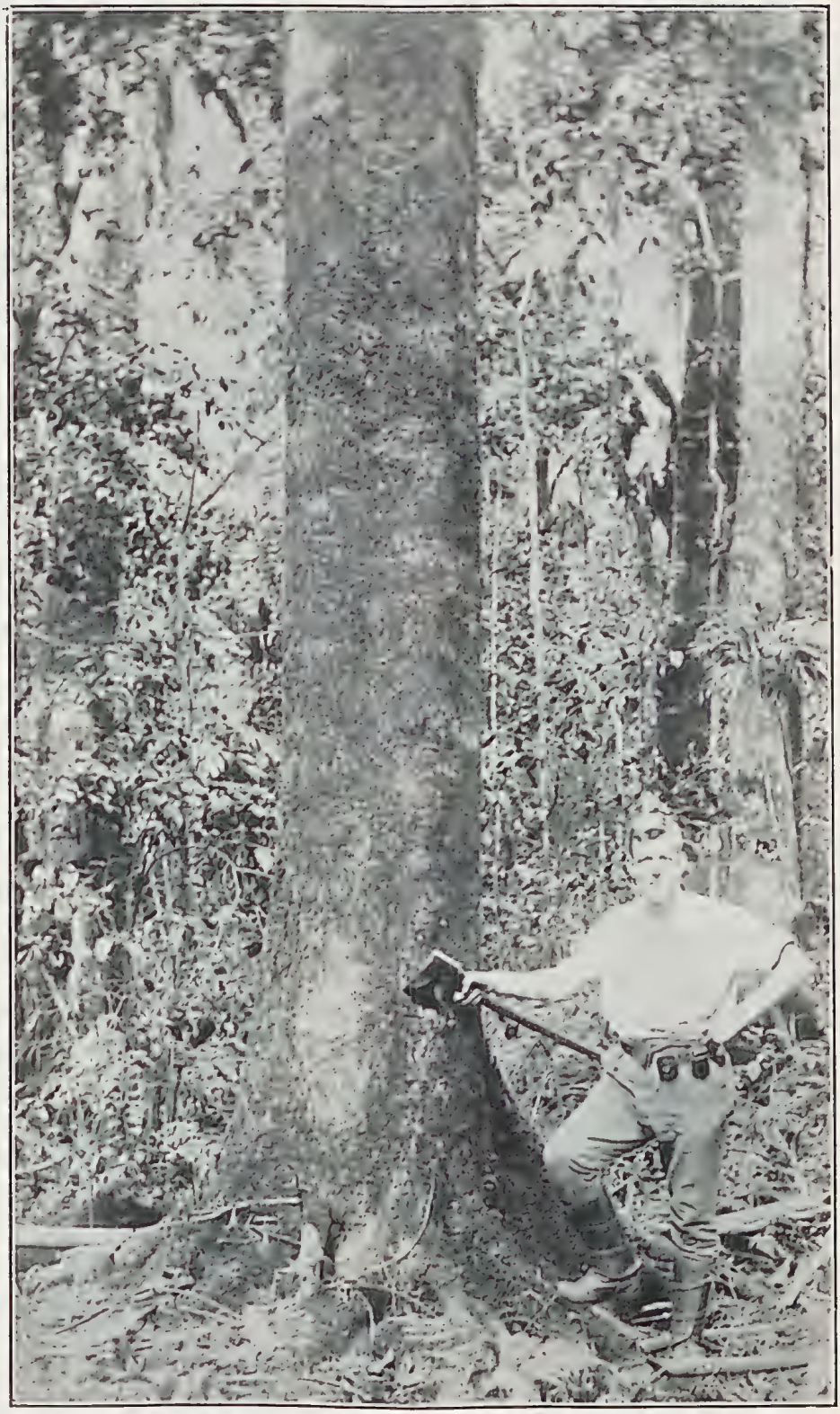

Photo. by the Authors.]

PLATE 52.—THE SOCKET WOOD (*Daphnandra micrantha*).
Ranges eastward of Emu Vale, Killarney District.

PLATE 53.—THE SOCKET WOOD (*Daphnandra micrantha*).

A.—Leaf showing underside. B.—Fruits. C.—Seeds.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 6th April, 1922) from the Southern Field Assistant, Mr. J. C. Murray:—

"During March the districts of Gin Gin, Bingera, and Nambour were visited. An inspection was also made of a portion of the country lying between Gympie and Yandina.

"Regarding the Gin Gin areas, the farmers are busy cultivating and planting. The crops look well, especially the 1900 Seedling. Provided the red soil gets an average amount of moisture, in this locality the Mauritius Seedling appears to do particularly well.

"Other canes that are giving the farmers satisfaction include Mahona, Rappoe, Q. 813, Shahjahanpur No. 10, H.Q. 285, and Demerara 1135. Standover cane is suffering slightly from disease, but nothing of a serious nature. No cane that is in any degree young and resistant is in anything but a healthy condition. Careful plant selection should continue to be the farmer's first consideration.

"Grubs are causing some growers more or less serious loss. In such cases the farmers are recommended to plant a resistant variety to this class of attack, such as D. 1135, cultivate often and thoroughly destroy if possible feed trees in the vicinity and experiment with poisons and repellants. The encouraging of birds, such as crows and ibises, is a good idea; the little bandicoot is also a friend of the farmer in this respect. Another factor of importance is to make sure the soil is not deficient in humus. A supply of vegetable matter in the soil diverts the attack from the cane root.

"Noxious weeds are not causing a great deal of trouble, excepting, perhaps, nutgrass, in places.

"It is too early yet to make any definite estimate, but as matters are going, the Gin Gin farmers should have a very fair crop. Rain is wanted, however. At Maroondan, the prospect of a good crop is fairly certain. The farmers have to work hard on these areas to keep a good tilth on their soil, but those who do thoroughly cultivate are generally amply rewarded for their trouble. Canes that are making rapid growth are Black Innis, 1900 Seedling, D. 1135, and D. 156. The farmers in the Maroondan area are particularly free from cane pests and the crops are showing no sign of disease. As frequently mentioned in connection with this place, the greater use of lime is essential, thus improving the texture of the soil, and consequently increasing its fertility. Maize as a rotation crop is to be recommended. Farmers are also urged to go in more for local experiment, which is the most conclusive method of determining the value of fertilising and other operations incidental to successful agriculture.

"Since last visiting the Bingera area there has been a great deal of rain and consequently the farms and plantation are looking very well. More rain will shortly be required, however, as this class of soil, being loose and friable, and having rapid production powers, can consume plenty of moisture.

"Varieties looking best at Bingera and South Kolan include, respectively, N.G. 16, Q. 813, M. 1900, D. 1135, D. 156, H.Q. 285, and Black Innis. Grub attacks are in evidence in places, although there is nothing serious as yet. On the eastern side of Bingera Railway Station farmers are obtaining splendid results, especially from 1900 Seedling. On the red forest loam this cane ratoons well and gives high sugar values. Meatworks fertilisers are principally used, the amounts applied per acre varying to suit the soil requirements. In this particular locality M. 87 and H.Q. 85 are also looking well.

"Oakwood Plantation is now a fine example of subdivision and closer settlement. All the farmers are doing well, and the district is to be congratulated on getting a fine type of settler to take up and farm this land. The cultivation leaves very little to be desired, and considerable experiment is being made with cane varieties and ferlilising. Regarding the latter, Mr. Hansen, an Oakwood grower, has done some interesting work in this respect with a mixture containing superphosphate, sulphate of ammonia, nitrate of soda, and sulphate of potash. In all it took about 6 tons of fertiliser to treat 20 acres, and the cost was approximately £120. The method of applying was to place in ratooning furrow by hand on both sides of the stool. Soil analysis was taken as a basis for their operations in conjunction with conclusions previously arrived at by local experiment.

"Varieties making good growth at Oakwood are M. 16804, M. 87, H.Q. 77, Shahjahanpur No. 10, Gingor, D. 1135, 1900 Seedling, N.G. 16, and H.Q. 285.

"The growers are adopting the sensible method of ploughing-in all available vegetable matter.

"In the Nambour district there is a general air of prosperity. Everywhere the fields are green, and land settlement and building are making rapid strides. Sugar-cane production is making satisfactory progress, and it is possible the mill may increase its capacity. Regarding agricultural operations and methods incidental to sugar-cane culture there is nothing of importance to note since last visiting this district. Mr. Story, at Mapleton, has a fine showing of D. 1135 ratoons, and has amply demonstrated that this beautiful district will produce cane as well as other produce. This gentleman, last season, cut a standover plant crop here which averaged him 40 tons per acre with an average c.c.s. value of 12. Other farmers have good crops in this area and should be greatly encouraged to continue planting. On Petrie's Creek and the Maroochy River good progress is being made towards improving the farms. New land is being cleared, drains are being improved, and tramline improvements effected. Drainage is probably the greatest difficulty the farmers have to contend with. Soil conditions still point to the need for lime and green manures. While the land naturally is fertile, the texture of the soil in some cases wants improving, and this can only be accomplished by careful and thorough farming.

"The Maroochy River is a very fine residential as well as farming locality. Few districts possess such possibilities as this place, with its fine waterway and natural beauty. Cane varieties making noticeable headway are H.Q. 285, Q. 813, 1900 Seedling, Black Innis, N.G. 16, and H.Q. 77. All these canes appear to be suitable at present for the Nambour district generally, and H.Q. 285, Q. 813, and 1900 Seedling should be a fine combination of varieties for farmers to plant.

"At Yandina, Mr. Bowder, an enterprising grower, has a fine block of ratoon cane. The varieties are H.Q. 285, Rappoe, Q. 813, and D. 1135. Most of the 70 acres Mr. Bowder has under cane have been put in with a mattock, but it is intended to further clear and plough the plantation.

"There is not a great deal of cane being produced between Gympie and Yandina, but at Eumundi, where there is a lot of fine agricultural land suitable for cane-growing, Mr. Cook, a prominent Eumundi resident, is contemplating planting cane on a larger scale than has hitherto been attempted. The reaction of a soil test taken at Eumundi shows slightly acid. Judging by appearances the humus content of the soil is good and the texture fair. Rappoe and H.Q. 285 are varieties that are growing well, and, if farmers were to seriously consider canegrowing, should do well."

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 4th April, 1922) from the Northern Field Assistant, Mr. E. H. Osborn:—

"*Lower Burdekin Notes* (continued).—Early in the month a couple of days were spent at the Haughton Valley district, under very wet conditions. I was told that during the mill's run of over nineteen weeks 37,035 tons of cane had been crushed, of which 11,917 tons came from Inkerman. Of the total tonnage about 12 per cent. was burnt.

"The average c.c.s., for the season was 14.46 per cent., and some fairly high-density canes were crushed. The highest c.c.s. of the different varieties were:—

H.Q. 426	17.30	Local cane
Badila	17.85	Inkerman cane
B. 208	16.20	Local cane
Q. 855	15.40	"
Goru 24, 24A	15.10	"
Goru 24B	15.30	"
D. 1135	14.70	"

"At the time of my visit the prospects for the coming season were most encouraging, as the cane (unirrigated) looks very well and some magnificent crops should be harvested during the year, provided, of course, that the climatic conditions continue at all normal.

"Most of the cane was planted in July and August last, and its heavy growth has caused it to fall down in places. The chief varieties noticed were H.Q. 426, B. 208, Badila, N.G. 24, 24A, 24B, Q. 855, Q. 813, Q. 970, Malagache, and M. 1900. In all these varieties some really good cane was seen, 7 and 8 ft. high.

"A very pleasing feature of this district is to notice how well the ratoons thrive, third and fourth being quite usual. At present the farms are fairly scattered and consequently some long haulage is inevitable, but with the advent of the proposed tramway (8 miles in length) conditions for closer settlement will be very much better, and the supply of cane for the mill very much improved.

"The average rainfall for this area varies from 50 to 57 in., the former figure representing the fall taken by Mr. Humphrey, at Giru, and the latter at Mr. W.

Church's, towards the Mountain. So far this year the conditions for a vigorous growth have been ideal, as Giru has had 24.13 in. of rain for January and February. Although this area is comparatively a new one, the growers are fully alive to the value of liming and manuring, and a number of them are either making use of same or intend doing so very soon.

"So far, although grubs are being turned up in ploughing operations, no damage is visible, although, of course, it is very early for such to be apparent.

"*Pioneer Mill.*—Regarding this particular area the cane looks remarkably well, and old growers say that the crops look better at this period of the year than they have done for quite a number of years, and given good growing conditions until crushing time some splendid crops should result. With the bounteous rains experienced early in the year an early start will probably be necessary to handle the large crop expected to be cut for 1922.

"During the season's operations 89,332 tons of cane were crushed, about a-quarter of which was burnt; the average tonnage per acre was 18.7 tons, and the average c.c.s. 14.84 per cent.

"The principal canes grown were the Gorus 24, 24A, 24B, H.Q. 426, Badila, B. 208, Striped Singapore, and in smaller quantities Q. 813, Q. 855, Q. 903, Hybrid No. 1, and Badila Seedling.

"*Inkerman* (comprising Home Hill Area).—Prior to my visit parts of the district had been favoured with showers of 3 and 4 in., whilst at the township itself only about 1.69 in. had fallen up to the end of the first week in March.

"All around the district some very good crops of cane were seen, especially some of the unirrigated farms, considering that up to early in March only 14.25 in. of rain had been registered for the year. Some particularly good 24B was seen on the unirrigated farms of Messrs. Marriott Brothers. In their vicinity, 'up river,' several windmills have been erected since last August, and the appearance of the cane irrigated by their use is very favourable. Another very fine block of Badila was seen on Mr. Mulholland's farm down the river. There are about 38 acres of plant, and some of it shows a very fine growth of cane—large healthy stools with a splendid top.

"There is some fine, deep alluvial soil on this farm, and a portable engine is used for irrigation. Taking the conditions all through the Inkerman cane looks very well, and provided favourable rain comes along to keep the unirrigated blocks in good condition until thoroughly grown, a splendid crop of cane should be harvested for Inkerman this season. Last season Inkerman harvested 128,700 tons of cane; 12,000 of this went to the Haughton, and 8,000 tons to Proserpine. Of this quantity about 50 per cent. was burnt, and the average density of the crop was 14.1 c.c.s.

"*Bowen Cane Areas.*—These areas were visited early in March and found to be looking remarkably well. The rainfall to date had been—January 472 in., February 13.28 in., and March 2.82 in., or a total of 20.82 in. These falls have given the cane a real good start, but further showers would help things along very considerably. The number of growers who supplied Proserpine with cane last year amounted to fourteen, but this number is expected to reach thirty-eight for the coming season. Quite a number of other growers are coming in for 1923, and it seems as if a considerable amount of cane will be annually railed to Proserpine from Bowen. The cane grown is mostly in the vicinity of the river, and nearly all of the growers possess small irrigation plants, and as most of the land has a slightly downward grade from the river back, these plants will be able to do the work required.

"*Proserpine Area.*—This district was reached in the middle of March, and it was noticed that owing to too much wet the growers had not been able to do as much work on the land as they would have liked. In numerous places paddocks had had one or two ploughings, but further work had to be postponed. Although the fall had been so constant, yet the total amount was only 27.08 in. to date—*i.e.*, January 3.12 in., February 19.53 in., March 4.43 in., total 27.08 in. Unfortunately, however, for some of the growers situated upon the river banks the rain early in February culminated in a flood overflowing the banks, and causing a fair amount of damage to low-lying adjacent areas. This, of course, will affect the tonnage expected this year to a certain extent.

"About the third week in March a spell of fine hot weather set in, and cultivation was resumed in earnest again. At present a large quantity of ploughing is being carried out, and grubbing operations are to be seen in practically every part of the district.

"Preparation for draining a very large area of land on the Hambledon Plains are also now in hand, and the opening of the line to Mackay will surely enable the mill to tap a further supply of cane land if required.

"Of the newer varieties of cane, Q. 813 with its second place for density, Q. 1121 with fourth, and Q. 903 with sixth, justify their growing on a far larger scale. A good deal of interest is being taken by the farmers' association in the work of the Experiment Station, as two of their members have just returned from a visit to the Mackay Station, and have supplied their association with an interesting account of their experience at Mackay, comprising also a list of the canes that they liked most now growing on the Station.

"In reviewing the district generally, it must be admitted that the cane, both plant and ratoon, is not as far advanced as it should be at this time of the year.

"Owing to too much wet very little early planting was carried out, and the ratoons also did not make the growth that they should from the same cause.

"As regards liming and fertilising, numerous growers speak of using both, and I am inclined to think that large quantities of same will be ordered ere very long, as the successful farmer in this area recognises the value of liming, thoroughly draining, and green manuring."

CANE PEST COMBAT AND CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Entomologist, Mr. Edmund Jarvis:—

"During the past four weeks 10 in. of rain has fallen here, promoting vigorous growth of the cane. On land where grubs are present, however, excessive wet at this time of year often proves detrimental to autumn-planted cane, which, when standing in super-saturated soil of a light character, needs the support of every root to prevent it from being blown over. This applies more particularly to early-planted crops of D. 1135, which are at present (25th March) carrying canes 8 to 10 ft. in length. With regard to late planting, it is worth recording that a 10-acre paddock of the above variety planted by Mr. D. McCaul last December—the stools of which are now about 4 ft. high—looks very promising, and is holding up well in light volcanic soil under very wet conditions. This paddock was kept bare during the flighting season, so that in all probability the beetles passed it by when ovipositing. It will be instructive to follow up the future development of this plot.

"We were interested also to learn from Mr. McCaul that See Chin, who grew cane successfully at Greenhills in the past, is said to have made use of moth-balls as a deterrent against cane-grubs. It may be well to mention in this connection that during November last, various experiments with napthalene were carried out by the writer at Meringa Laboratory. Doses of from ¼ to 1 scruple were placed in cages holding about 13 cubic inches of moist soil, each enclosing a grub of the 'Small Brown Beetle' (*Lepidiota frenchi*, Black).

"When examined twenty-four hours later, about 65 per cent. of the grubs were on top of the soil, half of them being in a dying condition, while the remainder were found below ground, and apparently normal. At the end of two days (19th November) 35 per cent. were dead, and the remainder either sick or dying. Five days after treatment, when the soil had become more or less flavoured with the odour of napthalene, all grubs usually succumbed after forty-eight hours. Grubs killed by this fumigant became flaccid, and before decomposing turned a peculiar pinkish-yellow colour.

"Field tests have not yielded satisfactory results. The odour from injections weighing a quarter of an ounce, buried in both heavy and light soils, did not, after a lapse of five weeks, penetrate in either, farther than from 1 to 1½ in.

"Unfortunately, laboratory experiments indicate that grubs of the 'grey-back' cockchafer are less susceptible to the smell of napthalene than those of *Lepidiota frenchi*. For example, a third-stage grub of the former beetle confined about 2½ in. from an injection was found after an interval of three weeks to be quite unaffected. Our outside tests, however, were made during the wet season. Under dry conditions the soil porosity would, of course, be better, and doubtless the odour would penetrate farther.

"It may be mentioned that napthalene does not injure cane roots and that the ordinary flaked form was found to be stronger than that sold under the name of moth-balls.

"GRUBS AT GREENHILLS

"This estate was visited on the 20th instant, and although unfortunately the cane on some portions is destroyed or showing unmistakable signs of grub infestation, it was interesting to find that the ravages of this pest had in some measure been controlled by the use of carbon of bisulphide. Owing to the courtesy of the manager, Mr. Hoelcher, and Mr. Flower of the Hambledon Plantation, we were able to note the result of experiments with this fumigant carried out by the C.S.R. Company

last month (February) on block J6. A number of ¼-acre plots, treated at rates of from ¼ to ¾ oz. per stool, are already showing encouraging results. Examination of one of the stools on a control plot which had lost most of its roots and was fast turning yellow, revealed the presence of four grubs of *albohirtum*, (grey-back beetle), three in the second and one in the third stage; while close alongside on a plot treated with ½ oz. per stool the cane showed no signs of injury, was quite green, and possessed an abundance of fibrous feeding-roots.

"With regard to general infestation it may be mentioned that on block N2, near the western boundary of the estate, where the cane is fast turning brown, we found about a dozen grubs under each stool, fully 60 per cent. of which were still in the second stage.

"MANURIAL VALUE OF CANE-BEETLES.

"An analysis of certain samples of beetle-meal, prepared at this Laboratory last January from the dried bodies of 'grey-back' beetles, has been received from our Agricultural Chemist, and on the whole, may be considered as favourable. Mr. Brünnich reports:—'The value as a fertilizer is about £11 per ton, and higher than that quoted for European cockchafer.' A few of the details of this analysis were as follows:—Nitrogen, 10.20 per cent.; phosphoric acid, 1.66; potash, 1.75; lime, 0.27; proteins, 63.75; fat, 4.82.

"It will be noticed from the above that this beetle-meal possesses a high food value; but, unfortunately, the sample submitted was found to contain 0.16 per cent. of arsenic. On this account Mr. Brünnich, when referring to the food-value, remarks:—'The use as a food for birds or fowls is doubtful on account of the fairly high amount of arsenic contained in sample. If the arsenic could be eliminated the beetle-meal would be a very valuable fodder.'

"Perhaps in the present instance the arsenic may have been derived from cane-land treated with this poison in hope of destroying the grubs. As much as 200 lb. per acre has been applied on some plantations, and as we know that grubs are continually ingesting soil for sake of the organic matter contained, and it through their bodies, we may, I think, safely infer that in the case of treated soil the arsenic swallowed, although not enough to prove fatal, would tend to gradually accumulate during the larval condition, and be absorbed into the system; and that this would naturally be passed on through the pupa to the beetle. Judging by analysis the arsenic would seem to occur chiefly in the chitinous or horny portions of the outer integuments, such as wing-cases, body sclerites, legs, &c., as a sample from which these harder portions had been removed by sifting were found to contain 0.4 per cent. less than that present in the whole-beetle meal.

"A NOTE OF WARNING.

"The above notes, coupled with the fact that growers here are remarking upon the scarcity or total absence during the last eighteen months of ibises and other grub-eating birds, appears significant, and I am of opinion that it would be advisable to discontinue the practice still favoured by some growers of sprinkling large quantities of white arsenic in cane drills; seeing that this has not so far proved effective against the grubs, and may result in the destruction of our useful insectivorous birds. One can understand that if a large bird, like an ibis, for instance, were to fill its stomach with grubs each containing a small proportion of arsenic, it might in this way easily obtain an accumulated dose of poison sufficient to prove fatal.

"PARASITE OF BEETLE-BORER.

"Very shortly, upon commencement of the normal dry season, we intend pushing forward the distribution of tachinid-fly parasites, which work has been postponed during the wet, humid conditions experienced here from January to March, which are favourable to spore germination of the entomogenous fungus, *Empusa* sp., a vegetable parasite of tachinid flies.

"It is satisfactory to be able to report that we have now succeeded in establishing these useful parasites in the Gordonvale district. Specimens bred in our laboratory, and liberated at Riverstone last December commenced at once to breed in the field, producing the first brood of flies five weeks later, 22nd January.

"Owing to the interest taken in this work by Mr. G. Alley, the standing cane has been left uncut, and the third brood of flies, which are due to appear from this cane next month (April) will, it is hoped, spread throughout that district, and prevent the borer from doing further serious damage.

"At Mount Sophia flies were released on 6th January, and about eight weeks later when scouting for results, Mr. W. C. Dormer, Assistant Entomologist, found a specimen of the fly among the cane. This, no doubt, was a survivor from the first brood, which had emerged about three weeks earlier, but served to show that the parasites had been breeding there; so possibly those arising from this brood may become established in that locality."

REPORT ON INVESTIGATIONS REGARDING PRICKLY-PEAR CONTROL BY BIOLOGICAL MEANS.

BY PROFESSOR T. HARVEY JOHNSTON, Scientific Controller.

As is well known, the Governments of the Commonwealth, Queensland, and New South Wales have co-operated financially in a scheme of investigations having in view the control of the prickly-pear scourge by means of its natural enemies, such as insects, fungoid organisms, and bacteria. The Commonwealth Prickly-pear Board, which controls the financial side of the work, consists of a representative appointed by each of the Governments concerned, while the whole of the investigational side is in charge of the Scientific Controller.

At a meeting of the Board just held in Brisbane, the writer reported on the present state of the inquiry, and from that report the following information is now being made available to the public, on account of the very encouraging results recorded in it.

In addition to various organisms brought back to Australia from South America, either by the writer or by Mr. W. B. Alexander, one of the members of the staff, four large consignments have been shipped across from the United States (chiefly from Texas, but some from Florida also) by another member of the staff, Mr. J. C. Hamlin, who is still engaged in the United States and the adjacent parts of Mexico, collecting and breeding material for transportation to Australia. Besides, a large number of organisms have been received from that country from time to time through the post. All material received is subject to plant quarantine.

Particular care has been taken to eliminate, by careful breeding, all parasites which might be likely to control the activities of the various organisms proposed to be employed in the biological campaign against the pest. Then, again, systematic experimentation is being conducted with a view to ascertaining, firstly, whether the organisms introduced are effective against all or any of the many kinds of prickly-pear now naturalised in Eastern Australia; and, secondly, whether they are likely to prove inimical to any plants (including fruits) of economic importance. Work along the lines indicated has been carried on for some time in the laboratories of the Prickly-pear Board, the headquarters being at Sherwood, near Brisbane, with a field station near Westwood in Central Queensland.

It is proposed to establish another field station very soon, its location to be in one of the prickly-pear infested districts of New South Wales. The Queensland experiment station was established first because of the more favourable climatic conditions for fungoid and insect development, on account of the warm moist summer.

Eight distinct kinds of fungi, known to cause disease in prickly-pears either in North or in South America, were introduced into the Sherwood laboratory. Of these several have as yet failed to respond to the cultural methods, while of the remainder, only one (*Glœosporium lunatum*) has proved itself to be of any real value. Under certain conditions—namely, combined heat and moisture such as occurs during Queensland summer—this fungus may set up a serious decay of infected pear joints under laboratory experimentation. It has not attacked any other plants experimented with. Until it has been tried out in the field, one cannot state what economic value it has.

A bacterial disease was discovered by the writer while in Florida in 1920, and the organism causing it has been isolated and carefully investigated in the laboratory, where it has proved itself to be capable of causing a very virulent disease amongst all the kinds of prickly-pear naturalised in Queensland and New South Wales. However, as its dissemination appears to depend on inoculation of each joint—a procedure which would be too expensive if human agency were used, on account of labour costs—the services of certain insect enemies of cacti are being tested with a view to utilising them. Of those now under observation at least one has shown itself to be a very efficient transmitter of the disease germ, while a second kind is also capable of carrying it from joint to joint.

Of the many species of insect enemies either brought or sent across from America, several have proved to be of very little value as possible controls, though they are restricted to prickly-pears. Amongst these might be mentioned the various cactus weevils (*Gerstæckeria* spp.), one kind of cactus bug (*Narnia*), and the cactus midges (*Asphondylia*).

Others, such as certain kinds of cochineals (*Coccus* or *Dactylopius* spp.), have been found to prefer certain kinds of prickly-pear. One species at present being cultivated in the laboratory readily attacks the spiny pest pear of the Burnett and Rockhampton districts, but does not normally develop to maturity on the common

pest pear (*Opuntia inermis*), nor on the velvety tree pear (*O. tomentosa*), though it will do so occasionally. This species of insect slowly destroys the affected prickly-pear joints, and tho ugh its effects take some time before killing the part to which they have attached themselves, yet their rapid multiplication during warm weather should make them a very useful ally in the work of controlling the pest. Certain Australian ladybird beetles have been found to prey upon and destroy it.

Besides the cactus bug already named, no less than four other species have been introduced. All of them belong to the genus *Chelinidea*. They are more or less gregarious. Their attacks cause the plant to become sickly so that little or no new growth is put forth. Their influence is then not so much destructive but retarding, and to that extent they should greatly help in controlling the pest. They have not, as yet, been found capable of transmitting the bacterial disease.

The cactus longicorn beetles, *Moneilema*, have proved to be very useful enemies of the different pest pears, which they literally eat up, exerting their destructive action both in the larval or grub stage as well as in the adult beetle stage. Unfortunately they breed slowly, and this fact will greatly limit the extent to which they can be utilised in the work. Certain other beetles (*Disonycha*) have been found to be of little or no use against the Australian prickly-pears.

Among the moths, three species stand out, not only on account of their highly destructive effects on the various kinds of pear but also on account of the readiness with which they can transmit the bacterial germs which cause the serious disease referred to earlier in this report. Among the moths are the two kinds of Moth Borers (species of *Melitara*) of which one—the Florida species—has as yet failed to become established, while the other—the Texas species—is doing excellent work, being capable of attacking and destroying all the various kinds of prickly-pear now naturalised in Australia, though apparently preferring the two commonest pest pears. The destructive work is begun as soon as the tiny larva escapes from the egg shell, and is continued for about three months, by the end of which time the full-sized caterpillar, now about two inches long, undergoes pupation, the grey moth emerging about a month later. A considerable amount of time has been spent in breeding up material free from the various parasitic wasps and flies with which some of the consignments were infected, and in controlling a bacterial disease which carried off great numbers in the caterpillar stage.

The other moth is a small yellow insect called *Mimorista*, which in its larval stage very rapidly destroys the young joints of prickly-pear. It is also capable of transmitting the bacterial disease already referred to.

The injuries caused by these three species of moths readily become invaded by scavenging flies. In the United States and South America there are many species which breed especially in decaying cacti, but although large numbers belonging to about half a dozen species (*Stratiomyidæ* and *Syrphidæ*) have been bred out in Brisbane from material received from abroad, yet none has become established here, as the flies have failed to lay eggs. Some small local flies (*Sepsids* and *Drosophilids*) have, however, shown that they will breed readily in rotting prickly-pear and thus aggravate the injuries caused by the other agents, but, as they are small and are not restricted to cacti, their effects are not likely to be as great as those of the true cactus scavenging flies. Further attempts are being made to introduce these desired insects from North America.

It will be seen from the above sketch of the work that the investigations in Queensland show that three groups of organisms stand out prominently, as giving great promise in the biological campaign against the prickly-pear menace—(1) the moth borers (*Melitara*), (2) the *Mimorista* moths, (3) the bacterial disease. The third is apparently dependent for its transmission on either of the former two groups, and though it can be readily propagated in the laboratory, it is of little use distributing it until either of the moth larvæ can be distributed too. Consequently the progress of the work of eradication depends, as far as the investigation shows, on the breeding of the moths. This breeding cannot be unduly forced on, and although a large number is confidently expected to be produced within the next month or two, yet the various species must be bred up in great numbers before any attempt to distribute them broadcast can be made. The public is then asked to refrain from requesting specimens of these prickly-pear destroyers, as none will be distributed until such time as they can be spared, and then the public will be informed through the Press. These insects can be best bred up, at this stage of the work, at one or other of the Board's laboratories.

The information obtained, set forth in brief in the foregoing statement, appears to be of such importance to the States of Queensland and New South Wales, and especially to those whose lands are invaded by the prickly-pear, that the Press of the various Eastern Australian capitals has been invited to assist in making it public.

Judging from the laboratory results, it seems as if there has now been established in Australia a complex of organisms which, provided they act together in the field as they are doing in the laboratory, and provided the moths breed sufficiently rapidly, may ultimately bring about complete control of the prickly-pear menace.

The influence of these biological agents will be at first slow, but as the numbers of insects grow so will the effects increase, and it is hoped that in a few years' time appreciable progress will have been made in those districts in which the organisms will be liberated. Of course, there may be various Australian insects or birds which may develop a liking for the introduced organisms and thus control their activities—*e.g.*, certain kinds of ants have been found to readily attack and destroy the young cactus bugs, and even *Melitara* larvæ during their wanderings, but these are matters which are beyond control in the field.

BANANA BEETLE BORER.

BY JOHN L. FROGGATT, B.Sc., Entomologist in Charge of Banana Beetle Borer Investigations.

An insect pest (belonging to the group commonly known as "Weevils") which has forced itself into great prominence amongst banana-growers is the Banana Beetle Borer. The original introduction of this borer into Queensland appears to be shrouded in mystery, but it would seem that on many different occasions when banana plants were introduced from the islands and Jamaica, this pest was brought in with them. By widespread distribution of the imported plants many centres of infestation were formed from which the beetle has spread. At the present time it appears to be scattered throughout a very large part of the banana areas and is still spreading further afield. Even in the last twelve months an appreciable increase in the extent of distribution and amount of damage done has been observed in areas where few or no precautions have been taken. There is no doubt that this pest demands the urgent co-operation of all banana-growers in order to cope with it successfully.

Scientific investigations were begun on the banana beetle borer problem in January, 1921, since when a large amount of work has been done both in the field and in the laboratory, as a result of which much important information has been obtained on the life and habits of the beetle at different periods of the year. Through lack of any published information on systematic research work on the problem, the investigations had to be taken up from the beginning.

The whole of the development of the beetle is passed within the plant, which renders close observation of the different stages extremely difficult and also nullifies the usual methods of treatment for insect pests.

The female beetle when ready to deposit the egg usually selects a site on the plant just about ground level, where the "stem" and the bulb join. She then eats out a small tunnel and, turning round, deposits the egg in the bottom of the tunnel by means of a slender hollow tube projected from the tip of the abdomen. The egg is then lying just underneath the surface of the plant. It is opaque white and about one-twelfth of an inch in length. The egg lies in the tunnel for several days before the larva (or "grub") emerges; this period varies enormously at different times of year, the maximum noted being 35 to 37 days in July, 1921, and the minimum 4 to 5 in January, 1922.

When the grub is ready to emerge, it cuts the egg-envelope by means of its jaws and, working itself free, begins to eat its way into the bulb of the plant. At first the tunnels are very small, but as the grub develops the tunnels become larger. Many grubs may be present in the one plant and in the course of their feeding destroy a considerable amount of the substance of the bulb, which may be called the storehouse of food not only for the plant but also for its product—the bunch of bananas. Where the bulb is badly infested no bunch at all may be formed, or the bunch may be small and the fruit undersized through lack of sufficient nourishment. It is not uncommon in badly infested plantations to find the young suckers small and weedy, again through lack of nourishment from the parent bulb. This is a very serious matter, for the continued prosperity of the plantation depends on the production of strong, healthy suckers.

In most cases the grubs tunnel partially round the outer portion of the bulb, and by this means damage, if not completely sever, the ends of the roots inside the plant; as a result the roots may die back or become weakened and more subject to attack by diseases, and the plant, for want of proper support in the ground, falls out of the stool.

1.—Unflattened specimen, showing convexity of dorsal surface.

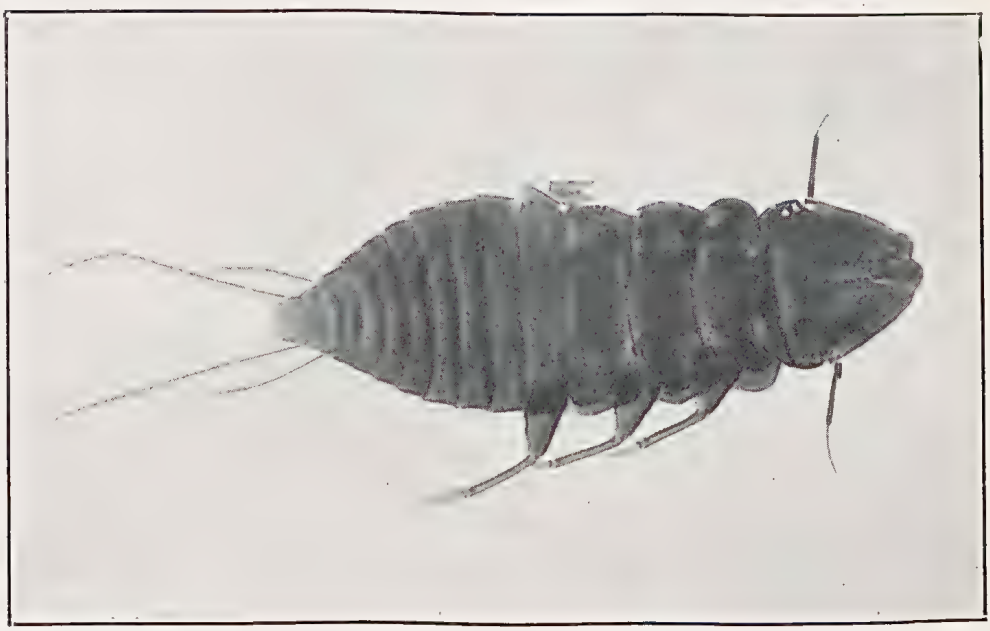

Photo. W. C. Dormer.]

2.—Specimen mounted in balsam (magnified 153 diameters).

PLATE 54.—TRIUNGULIN OF MACROSIAGON CUCULLATA, MACL.

When nearing full growth the grub tunnels towards the outer surface of the bulb and in the end of the tunnel turns into the pupa which is nearly always found just underneath the surface of the bulb below ground level. The grub stage occupies 3 to 4 weeks in the warmer portion of the year, but in the colder months this period has been extended to almost 7 weeks. The grub, when full grown, measures a little more than half an inch in length and is white with a very distinct reddish-brown head.

The pupal stage occupies 5 to 7 days in the warmer part of the year, but in the winter it is considerably prolonged. During this stage no movement occurs while the larval structures disappear and the parts of the beetle gradually form. When almost fully developed the pupa changes from creamy to a light yellow or reddish brown, which is the colour of the beetle when it emerges.

After emergence the beetle is comparatively soft, and lies quiet in the pupal chamber for several days, during which time the body becomes harder and the colour darker: that of the mature beetle is black. Before the full colour has been attained, however, the beetle may eat its way out through the plant into the soil. The beetle is a little less than half an inch in length, but specimens are obtained very much smaller than this, due to starvation in the larval stage.

At least a fortnight elapses from the date of emergence of the beetle until the first eggs are laid, but from then on the deposition of eggs is continuous. Variations in egg deposition are marked in the hotter as well as the colder months, being less at these times than in the spring and autumn.

The beetles are found sheltering (and, perhaps, feeding) in the rotting stems and corms, often in numbers.

Experiments have shown that the beetles are most abhorrent of light: though they move *under* the surface of the soil by day they are never found *on* the surface exposed to light. It is thus extremely difficult to follow the movements of the beetles by night. Experiments have been carried out with different-coloured lights to try and find a colour which would not drive them away. So far these tests have proved unsuccessful.

Numerous experiments were carried out, largely in the field, to endeavour to prove whether the beetles flew or not. So far the results have been entirely negative.

Series of tests were made with various oils, &c., to test their efficacy as attractants or deterrents. None of the substances so far tested have any practical value for application in the field.

The life of the beetle is a long one. Of beetles collected in January, 1921, and fed on banana corm, the last died at the end of March, 1922; in other cases of beetles bred in the laboratory and collected in the field during last year, a large number are still alive.

A long series of tests are at present being carried out on poisoning, which, from laboratory results, appear favourable as a means of destroying the beetles. If the laboratory results prove satisfactory, field tests will be instituted to prove its value under practical conditions.

The only means of control that are at present practicable are to dig out and destroy infested material and lay "corm baits" to "trap" the beetles. To make these baits, split a banana bulb into several pieces and lay each piece with a cut surface flat on the ground in or alongside the infested stool; examine these "baits" once a day (the morning for preference), and destroy the beetles found underneath them. Careful attention must be paid to the stems lying on the ground, as these are also liable to be breeding-grounds for the beetle borer. If chopped into small pieces, though eggs be laid in them, the grubs will not be able to mature for want of sufficient food, and the stems will rot or dry up much faster than if left whole.

Of natural enemies there is very little evidence. On three occasions a predaceous beetle grub has been found which attacks the grubs and the beetle of the banana borer, but so far there is no satisfactory evidence of this grub ever acting as a check on the development of the banana borer.

In October, 1921, a small consignment of a predaceous beetle, an enemy of the banana beetle borer, was received from Java, and liberated at once in a small area when infestation was bad in the bananas. So far it has not been recovered; but, as Jepson records that the developmental period is a long one (Bulletin 7, Dept. of Agric., Fiji), it must not be taken for granted that this beetle has died out.

NORTHERN EXPERIMENTS—1921-1922.

POTATOES IN COMPARATIVE TRIAL—TOLGA.

By N. A. R. POLLOCK, Northern Instructor in Agriculture.

Farm of W. S. Allen, Tolga.

Forest land; broken up, 1920.

Crop of cowpeas for seed, harvested May, 1921.

Land ploughed 7 in. deep—June, 1921.

Land ploughed 7 in. deep—September, 1921.

Drills 4 ft. 3 in. apart, 18 in. between sets.

Planted 13th September.

Good rains fell in October, but, November and half December being without rain, the plants received a severe check, but responded excellently to the rains when they fell in late December.

Harvested 6th and 7th March, 1922.

Results—

	Per Acre (saleable). Tons.	Cwt.
Up-to-date	4	15
Brownell Beauty	4	0
Plunket	4	7
Carmen	3	15
Beauty of Hebron	3	10
Victory	3	5
Early Rose	2	5
Manistee	1	13

Remarks.

Up-to-date maintains its superiority in yield. Every root dug well, second growth being almost entirely absent and percentage of "smalls" very low.

Plunket.—A poor strike resulted from the seed, but the potatoes came true to type; last season the resultant potatoes would not be recognised as Plunkets. Plants yielded consistently and, as with the coastal lands, this variety can be recommended.

Brownell Beauty.—Yielded well, but badly subject to second growth, many of the tubers being ill-shaped and unsaleable.

Carmen.—An old favourite in the district, yielding nicely-shaped attractive tubers, and a consistent fair cropper.

Beauty of Hebron.—During the growing season this variety promised to eclipse all others: it flowered first, and when the rains came made a heavy growth of top and produced some very good tubers. Had the season been good it should have yielded heavily. Certainly worthy of more extended trial.

Victory.—This potato in appearance, growth, and length of season is very similar to Up-to-date. The proportion of saleable potatoes was the best of the trial. Worthy of further trial.

Early Rose.—Being an early sort, this variety, like Beauty of Hebron, probably suffered more from the dry weather. Tubers were small and trial disappointing.

Manistee.—Only a 50 per cent. strike occurred, and the variety did not appear thrifty at any stage of growth. In the scrub soils late plantings in February and March with this variety are more successful. Cannot recommend it for main-crop plantings.

Coronation.—Seed was very mixed, and appeared more like Brownells. The variety is understood to be a blue potato similar to Guyra Blue or Commonwealth. No record of yield made.

Manhattan.—Owing to unsound seed only a few roots matured, but these yielded well, and the variety is worthy of further trial.

On the whole, considering the season experienced, which is unique in the history of the Tableland—heavy rains in October followed by six or eight weeks' dry weather—the results are distinctly good. Had the rains, as is usual, followed on the first heavy fall, the result would have been much heavier and the early maturing sorts would have turned out better, especially Beauty of Hebron, which, with Manhattan, stands more heat than other varieties.

SHOW DATES, 1922.

Show society secretaries are invited to forward for insertion in this list dates of forthcoming shows. Alterations of dates should be notified without delay.

Longreach: 2nd and 3rd May.
Wondai: 3rd and 4th May.
Charleville: 3rd, 4th, and 5th May.
Toogoolawah: 4th and 5th May.
Grafton: 3rd to 6th May.
Blackall: 9th and 10th May.
Miriam Vale: 9th and 10th May.
Mitchell: 10th and 11th May.
Boonah: 10th and 11th May.
Murgon: 10th and 11th May.
Roma: 16th and 17th May.
Emerald: 17th and 18th May.
Kilkivan: 17th and 18th May.
Ipswich: 17th and 18th May.
Wallumbilla: 23rd and 24th May.
Maryborough: 23rd to 26th May.
Hughenden: 23rd and 24th May.
Springsure: 24th and 25th May.
Lowood: 25th and 26th May.
Childers and Beaudesert: 30th and 31st May.

Bundaberg: 1st to 3rd June.
Marburg: 2nd and 3rd June.
Brookfield: 3rd June.
Cairns: 7th and 8th June.
Gin Gin: 7th and 8th June.
Woombye N.C.A.H.S.: 7th and 8th June.
Mount Larcom: 9th and 10th June.
Gladstone: 15th and 16th June.
Rockhampton: 22nd, 23rd, and 24th June.
Esk: 28th and 29th June.
Mundubbera: 29th and 30th June.

Mackay: 30th June and 1st July.
Gayndah: 4th, 5th, and 6th July.

Nambour: 5th and 6th July.
Townsville: 5th and 6th July.
Charters Towers: 12th and 13th July.
Gatton: 12th and 13th July.
Proserpine: 13th, 14th, and 15th July.
Rosewood: 19th and 20th July.
Caboolture: 20th and 21st July.
Mount Gravatt: 22nd July.
Barcaldine: 25th and 26th July.
Crow's Nest: 26th July.
Pine Rivers: 28th and 29th July.
Wellington Point: 29th July.

Sandgate: 4th and 5th August.
Royal National: 7th to 12th August.
Belmont: 19th August.
Murrumbidgee: 22nd to 24th August.
Coorparoo: 26th August.
Kenilworth: 31st August.

Beenleigh: 1st and 2nd September.
Zillmere: 1st and 2nd September.
Gympie: 7th, 8th, and 9th September.
Wynnum: 9th September.
Imbil: 13th and 14th September.
Laidley: 13th and 14th September.
Sherwood: 16th September.
Rocklea: 23rd September.
Kilcoy: 28th and 29th September.

Esk Camp Drafting: 4th and 5th October.
Pomona, 4th and 5th October.
Southport: 6th October.
Enoggera: 7th October.

DAIRYING INDUSTRY.

BOARD MEETING, 6TH APRIL, 1922.

A large number of important matters were dealt with by the Advisory Board, and amongst those coming before the Board for consideration were:—

The Board has received notification from the Railway Department that their request for a 20 per cent. reduction in rail freights on dairy products in their manufactured state to market has been complied with, and that same would operate as from the 3rd April, 1922.

In view of the injury in transit and the consequent depreciation of cheese sent loose by rail to Brisbane, it was recommended by the Board that all cheese for export should be crated at the factories and consigned therefrom direct to the cold stores; this recommendation to come into operation from the commencement of the next export season.

The Board has decided to interview the Commissioner for Railways and discuss with him matters pertaining to better facilities for transport, &c., of dairy products to factories.

The Board realises the importance and need for the introduction of a standardised system of bookkeeping and costing system in factories so that the management of same may be conducted upon the most economical lines, and intend to urge the adoption of such a scheme as soon as possible.

A recommendation was made to the Minister for Agriculture in connection with railway charges on bacon factory products carried by rail from the factory to the market.

DAIRYING INDUSTRY ADVISORY BOARD.

PLATE 55.—Standing (Left to Right)—T. FLOOD PLUNKETT, W. PURCELL, H. KEEFER.
Sitting (Left to Right)—J. E. DEAN, W. T. HARRIS, E. GRAHAM (Chairman), G. BURTON, W. H. FRANKLIN (Secretary).

FRUIT FLY INVESTIGATIONS.

[FIRST PROGRESS REPORT.]

BY HUBERT JARVIS, Entomologist in charge of Fruit Fly Investigations at Stanthorpe.

Early in February Mr. Hubert Jarvis, of the Division of Entomology, Department of Agriculture and Stock, was appointed to investigate the fruit-fly problem in the Granite Belt. The following report of his observations and activities covers the period from 12th February to 12th March, 1922, and is made available for publication by the Minister for Agriculture and Stock (the Hon. W. N. Gillies, M.L.A.):—

The greater part of the time embraced in the following report has been spent interviewing orchardists and inspecting orchards, travelling, and making arrangements for and establishing the office in Stanthorpe.

The following sub-districts have been visited:—

Dalveen, Cottonvale, Thulimba, Summit, Applethorpe, Stanthorpe, Beverley, Broadwater, Glen Aplin, Eukey, and Ballandean.

In all these areas the Queensland fruit fly (*Dacus Tryoni*) was found to be present in one or more of its phases.

It appears with the earliest fruit, and disappears with the latest, thus being active for a period of about six months.

The following fruits have been examined and found to harbour fruit fly larvæ or maggots:—

Stone Fruits—Peach (var. Comet) and Nectarine.

Pommaceous Fruits—Apple, var. Jonathan, Five Crown, Munro Favourite, Granny Smith, Gravenstein, Delicious, Lady Hopetoun. Pear—Beurre Box and one other.

Other fruits—those of earlier production—said to be attacked are Prune, Plum (all varieties), Cherry Plum, Cherry, and Fig.

No wild fruits suitable for the development of the fruit fly (*D. Tryoni*) have yet been met with in the Granite Belt.

THE EGG OVIPOSITION.

The eggs of the fruit fly have been found in the following fruits:—

Apples: Five Crown, Jonathan, Gravenstein.

Peach: var. Comet.

Oviposition appears to be continuous, varying stages of maggot growth having been found in single fruits, the eggs also being present.

The eggs are laid side by side in a cavity made by the ovipositor (egg-layer) just beneath the skin of the fruit. The ovipositor, when in use, protrudes beyond the end of the body of the female, and can, therefore, easily be seen with the naked eye.

The number of eggs laid in individual punctures (in fruit examined) varied from four to eight. The fly usually chooses a spot on the sunny side of the fruit, or on any swelling likely to ripen and sweeten early. In the peach, the first attack is almost invariably on one of the ridges or cheeks of the fruit. The fruit fly appears to be attracted by the aroma of ripening fruit. Thus, fruit situated on the outside of the tree, and that matures earlier than fruit deeply sheltered, is in consequence more badly attacked by the fly.

It has been observed that the suitability or otherwise of the medium (tissue) in which the eggs are deposited is a governing factor in hastening or retarding the hatching of same. Thus, with eggs laid in hard, immature apples, this is delayed and they often perish, with the result also that the surface of the fruit has a pitted appearance, owing to the tissue surrounding the puncture growing outwards and leaving the mark or sting in the centre. These marks are locally known as "dead stings."

As many as thirty punctures have been found in one fruit (Five Crown apple), and as few as one only.

THE MAGGOT.

The maggot when hatched in the peach usually works inward to the centre, there obtaining probably the maximum amount of heat and moisture—two conditions favourable to its rapid development.

In the apple, on the other hand, the maggot appears to keep fairly near the surface until about half-grown, when it works inward, being at that stage more able to break down the tissue and create those conditions desirable for its growth.

As many as forty maggots have been found in one peach (eggs also being present), and seldom fewer than fifteen maggots (thus showing the importance of collecting all infested fruit and destroying same).

The number of maggots is, however, by no means in correspondence with the number of punctures.

Eggs may perish owing to unsuitability of tissue or fungus-disease; and flies are often accidentally disturbed while boring the fruit before they have time to lay their eggs.

THE PUPA.

The pupa has been found in the soil (under trees carrying fruit) at varying depths, from ½-in. to 3 in.—*i.e.*, 2 to 3 in. in clean or clear ground, and ½ in. to 1 in. in ground covered with weeds and grass.

The pupa has, too, been found within the fruit (apple) and also slightly projecting from same. A search has been made for pupæ under trees, the crops of which, with a history of maggot-infestation, have been some weeks gathered, the soil being sifted to a depth of 1 ft., with, however, negative results.

THE ADULT FLY.

The fruit fly (*Dacus Tryoni*) has on several warm, sunny days been observed on the wing, and also ovipositing in peaches at Dalveen, the Summit, and Eukey, but nowhere in any numbers, probably owing to the lateness of the season. The specimens observed were shy and restless and very easily disturbed.

OTHER FRUIT FLIES.

One specimen only of *D. Tryoni*, var. *solani* (H.T. MSS.) male has been met with. This specimen was caught in a "Magnet" trap with "Magnet" lure, at Mr. D. Stephen's orchard at Dalveen; this trap, according to Mr. Stephen's testimony, had been set for about two months, and had not, during this period, been examined. (The scent of the lure was still quite strong, however.)

WORK IN HAND.

A collection is being formed, embodying all stages of development of the fruit fly, for reference and for experimental work.

Steps are being taken to secure, by breeding, a large stock of pupæ and adult flies; this material is required for investigation.

Projected experiments are along the following lines:—

To ascertain—

(1) The depth to which the maggot will penetrate into the soil.
(2) The longevity of the adult fly.
(3) The duration of the pupal stage during the winter months.
(4) The possibility of breeding the fly during the winter.
(5) In which stage or phase of its development, and where, the fly winters.

CONTROL MEASURES.

Natural Enemies.

Two species of ground beetles (Carabidæ) have been found plentifully under infested fruit and leaves; and are, doubtless, doing useful work as predators.

The Fruit Fly Parasite (*Opius Tryoni*, Cam., Braconidæ) has so far not been met with.

CONCLUDING REMARKS.

At present *the only practical means of control* is in cleaning up all infested fruit, both *on the ground and on the trees*, and boiling, burying, or burning same. Boiling is, however, by far the safest and best means of destruction. Burying (if 18 in. deep, and the ground pressed hard) should prove fatal to the maggots and pupæ; experiments projected will indicate the correct procedure in this respect. The method of destruction by drowning will also be tested; but there are already grounds for concluding that, on the fruit being put into a large tub or barrel and covered with water, any maggots harbouring in it would be destroyed.

Trapping by Means of Lures.

Some measure of success has apparently been achieved in this direction by Mr. A. Hall, of the Summit. He has, I believe, succeeded in trapping both the male and female of the Queensland Fruit Fly (*Dacus Tryoni*). Flies submitted to me by him, as so trapped, I have identified as of this species; about 25 per cent. of the number submitted (80) were male flies, and the remainder females.

I have seen (in the field) one Fruit Fly (*D. Tryoni*) female enter Mr. Hall's trap (baited with this "new lure") and get caught; but I have not as yet had an opportunity to observe its action or test it further.

OTHER FRUITS AND VEGETABLES, &C.

Fly maggots, closely resembling in habits and structure the maggot of the Fruit Fly (*D. Tryoni*), have been found by me in Tomato. These maggots are being bred-out in the office, and may probably prove to be the maggot stage of the Tomato Fly (*Lonchea splendida*).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1922 AND 1921, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1922.	Mar., 1921.		Mar.	No. of Years' Records.	Mar., 1922	Mar., 1921.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	9·11	21	5·91	26·25	Nambour	9·85	26	0·92	13·70
Cairns	18·21	40	11·24	32·21	Nanango	3·44	40	0·60	6·28
Cardwell	16·41	50	9·06	18·38	Rockhampton ...	5·07	35	1·59	3·84
Cooktown	14·99	46	19·55	25·48	Woodford	8·32	35	1·39	12·16
Herberton	8·41	35	5·91	21·13					
Ingham	16·25	30	11·14	15·26					
Innisfail	26·11	41	15·74	62·62					
Mossman	18·84	14	23·08	32·78	*Darling Downs.*				
Townsville	7·89	51	1·34	2 93					
					Dalby	2·77	52	0·48	1·18
Central Coast.					Emu Vale	2 69	26	0·90	0·61
					Jimbour	2·66	34	1·57	2·15
Ayr	7·37	35	1·01	6·48	Miles	2·78	37	0·85	2·10
Bowen	5·99	51	2·11	11·71	Stanthorpe ...	2 80	49	1·20	1·77
Charters Towers ...	3·66	40	8·12	5·44	Toowoomba ...	3·95	50	0·94	5·15
Mackay	12·62	51	2·15	28·58	Warwick	2·70	57	0·22	0·82
Proserpine	12·73	19	4 33	26 87					
St. Lawrence ...	6·07	51	0·15	4·50					
					Maranoa.				
South Coast.									
					Roma	2·86	48	0·55	3·01
Biggenden	4·32	23	0·65	4·08					
Bundaberg	5·55	39	1·07	3 31	*State Farms, &c.*				
Brisbane	5·84	71	2·01	7·86					
Childers	5·19	27	0·54	4·45	Bungeworgorai ...	1·81	8	0·26	2 78
Crohamhurst ...	11·67	30	2·17	14·09	Gatton College ...	3·55	23	0·03	3·64
Esk	4 94	35	0·98	5·44	Gindie	2·89	23	0·80	1·06
Gayndah	3 31	51	1·53	4·29	Hermitage ...	2·64	16	0·36	6 29
Gympie	6·34	52	2·01	6·73	Kairi	7·99	8	7·15	31·17
Glasshouse M'tains	9·79	14	1·54	14·60	Sugar Experiment Station, Mackay	11·93	25	1·59	26·31
Kilkivan	4·08	43	1·87	4·70	Warren	2·96	8	1 01	2·11
Maryborough ...	6·41	51	0·80	5·10					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

THE 1922 SUGAR CROP.

The General Superintendent of the Bureau of Sugar Experiment Stations states that a rough preliminary estimate of the 1922 Queensland sugar crop places the figure at present at about 290,000 tons. The yield was expected to be higher than this, but the recent dry weather at Bundaberg and Mackay has reduced the expected tonnage to some extent. Whether the above figure will be realised depends on a continuance of favourable weather, which would mean more rain in the Bundaberg and Mackay districts. The cyclone and flood season should now be over, but there is still the frost menace in the Southern districts to be considered. The above output will be in excess of last year's figures (281,000) and also of the present consumption.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1922.

The laying for the concluding month of the 1921-22 competition was very inferior. This can be attributed to an unavoidable change in feed. Heavy moulting was prevalent in nearly every pen. The following identification rings were placed on the birds competing in the single tests:—Light breeds—"A," white band; "B," red; "C," blue; "D," green; "E," pink; "F," yellow. The heavy breeds are the same, with the exception of "A" bird, which has a black ring instead of a white. The fresh birds competing in the 1922-23 test are placed in pens as follows:—"A," white band; "B," red; "C," blue; "D," green; "E," pink; "F," yellow. The returned birds which laid 200 2-oz. eggs, or over, in single tests, have a sealed band on leg with number of eggs laid in 360 days. The scores for the month are for thirty days, all birds being returned on 31st March. The following are the individual records:—

Competitors.	Breed.	Mar.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns	71	1,519
*W. and G. W. Hindes	Do.	76	1,509
*T. Fanning	Do.	84	1,479
*Mrs. R. Hodge	Do.	80	1,471
*H. Fraser	Do.	81	1,431
R. Gill	Do.	70	1,384
Oakleigh Poultry Farm	Do.	97	1,368
*C. M. Pickering	Do.	57	1,321
F. Birchall	Do.	74	1,319
*Geo. Trapp	Do.	58	1,317
R. C. Cole	Do.	97	1,301
W. A. Wilson	Do.	96	1,297
Mrs. E. White	Do.	88	1,286
*H. C. Towers	Do.	87	1,277
*W. Becker	Do.	51	1,276
*Thos. Taylor	Do.	49	1,258
Bathurst Poultry Farm	Do.	84	1,245
H. C. Thomas	Do.	53	1,244
*Thos. Eyre	Do.	48	1,243
*C. Goos	Do.	38	1,242
*S. L. Grenier	Do.	42	1,232
*R. C. J. Turner	Do.	29	1,229
*E. A. Smith	Do.	65	1,226
*E. Chester	Do.	56	1,223
*G. Williams	Do.	61	1,221
*Mrs. L. Anderson	Do.	48	1,121
*J. W. Newton	Do.	41	1,194
J. W. Short	Do.	52	1,193
M. F. Newberry	Do.	56	1,192
H. Stacey	Do.	66	1,187
*B. Chester	Do.	55	1,174
W. Barron	Do.	61	1,172
*H. P. Clarke	Do.	40	1,162
*Haden Poultry Farm	Do.	34	1,154
Linquenda Poultry Farm	Do.	75	1,124
O. C. Goos	Do.	58	1,119
Mrs. E. Z. Cutcliffe	Do.	53	1,084
E. Stephenson	Do.	51	1,067
*W. and G. W. Hindes	Brown Leghorn	56	1,028
Brampton Poultry Farm	White Leghorns	49	1,022
W. N. Glover	Do.	35	1,009

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Mar.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	91	1,487
W. Becker	Langshans	105	1,457
*R. Burns	Black Orpingtons ...	62	1,424
*T. Hindley	Do.	78	1,406
*A. E. Walters	Do.	72	1,384
*Parisian Poultry Farm	Do.	78	1,372
*C. C. Dennis	Do.	75	1,350
*J. Ferguson	Chinese Langshans ...	65	1,311
G. Muir	Black Orpingtons ...	95	1,310
Jas. Ryan	Rhode Island Reds ...	82	1,309
*E. Morris	Black Orpingtons ...	76	1,302
Rev. A. McAllister	Do.	57	1,264
*J. Cornwell	Do.	76	1,246
*E. F. Dennis	Do.	56	1,234
Jas. Every	Langshans	79	1,220
Jas. Potter	Black Orpingtons ...	92	1,218
*N. A. Singer	Do.	50	1,211
*J. E. Smith	Do.	79	1,196
*H. M. Chaille	Do.	82	1,166
*R. Holmes	Do.	65	1,159
*E. Oakes	Do.	58	1,156
*E. Stephenson	Do.	74	1,147
G. Cumming	Do.	63	1,138
*A. Shanks	Do.	57	1,131
*Mrs. G. Kettle	Do.	45	1,126
J. W. Newton	Do.	46	1,059
F. Harrington	Rhode Island Reds ...	74	1,056
T. C. Hart	Black Orpingtons ...	63	996
Total	...	4,517	85,855

* Indicates that the pen is engaged in single test.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	248	247	292	241	293	198	1,519
W. and G. W. Hindes (W.L.) ..	268	240	256	270	242	233	1,509
T. Fanning	256	241	282	230	225	245	1,479
Mrs. R. Hodge	248	242	267	256	258	200	1,471
H. Fraser	285	210	260	253	228	195	1,431
C. M. Pickering	244	235	239	198	211	194	1,321
Geo. Trapp	244	200	233	206	235	199	1,317
H. C. Towers	221	201	226	181	203	245	1,277
W. Becker	248	236	199	198	217	178	1,276
Thos. Taylor	223	205	207	178	188	257	1,258
Thos. Eyre	224	193	170	207	242	207	1,243
C. Goos	217	228	185	155	180	277	1,242
S. L. Grenier	194	237	178	212	210	201	1,232
R. C. J. Turner	205	202	204	211	192	215	1,229
E. A. Smith	257	165	232	216	196	160	1,226
E. Chester	241	188	197	191	193	213	1,223
G. Williams	269	223	177	169	206	177	1,221
Mr. L. Anderson	217	219	181	199	220	185	1,221
J. W. Newton	209	228	250	194	134	179	1,194
B. Chester	173	183	213	198	213	194	1,174
H. P. Clarke	240	151	203	161	224	183	1,162
Haden Poultry Farm ..	144	198	214	210	194	195	1,154
W. and G. W. Hindes (B.L.) ..	163	174	164	117	158	252	1,028

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	188	205	302	214	244	271	1,424
T. Hindley	246	247	265	183	215	250	1,406
A. E. Walters	282	228	223	210	220	221	1,384
Parisian Poultry Farm	243	226	218	312	165	208	1,372
C. C. Dennis	220	197	208	253	244	228	1,350
J. Ferguson	216	209	224	254	218	190	1,311
E. Morris	246	213	163	246	214	220	1,302
J. Cornwell	174	226	206	234	187	219	1,246
E. F. Dennis	208	218	199	187	204	218	1,234
N. A. Singer	221	205	182	211	172	220	1,211
J. E. Smith	267	284	185	133	166	161	1,196
H. M. Chaille	153	216	209	239	186	163	1,166
R. Holmes	167	209	197	205	213	168	1,159
E. Oakes	201	190	198	215	172	180	1,156
E. Stephenson	233	190	210	210	147	157	1,147
A. Shanks	162	190	191	200	166	222	1,131
Mrs. G. Kettle	184	223	248	112	170	189	1,126

CUTHBERT POTTS,
Principal.

General Notes.

PUBLICATION RECEIVED.

The "Dairyman's Calendar," compiled by Lever Bros., Ltd., Melbourne and Sydney, a booklet which should prove a considerable help in the business of Dairy Farming, dealing, as it does, with the feeding and general treatment of dairy cattle for each month in the year, as well as of their particular ailments, injuries, &c.

The booklet is obtainable "post free," Sunlight Works, Sydney.

PRICE OF CHAFF BAGS AND WOOL BALES.

Cotton growers are informed that the State Produce Agency, Turbot street, Brisbane, can supply chaff bags at 6½d. each, and wool bales at 3s. each, suitable for cotton intended for transport.

TOWERS PASTORAL, AGRICULTURAL, AND MINING ASSOCIATION.

The committee have changed the dates for holding the Association's Annual Show, from Wednesday and Thursday, 12th and 13th, to Tuesday and Wednesday, 11th and 12th July, 1922.

Answers to Correspondents.

SUN-DRYING OF BANANAS.

C. B. SUTTON, Novar, Bilambil, Tweed Heads—

In reply to your query of even date regarding sun-drying of bananas, Mr. A. H. Benson, Director of Fruit Culture, writes:—"This is a very simple matter. The fruit should be allowed to become thoroughly ripe, the skin should then be removed and the fruit placed on wooden trays 3 ft. long and 2 ft. wide, made by nailing four pieces of timber 6 in. wide and 3 ft. long to a cleat at each end, the cleats to be 2 in. by 1 in. The trays are then exposed to the direct rays of the sun, and when the fruit is dry on the one side it should be turned over so as to dry the other side. The fruit—when sufficiently dried which is known by its consistency, that is to say, there must be no moisture—is then placed in a sweat box to even up. The sweat box consists of a light case of any desired size in which the fruit is placed loosely. Whilst in the sweat box the fruit which is over dried absorbs the moisture from the fruit that is under dried and the sample then becomes of even quality. After the fruit is removed from the sweat box it should be placed in a wire bucket and dipped for about five seconds into boiling water, this is to kill any eggs that may have been laid by moths or other insects on the fruit during the process of drying or sweating. After dipping the fruit is placed on the trays which are put out in the sun and fruit thus rapidly dried. It is then ready to pack. The finished product should be packed in any size boxes that are desired, the boxes should be lined with clean paper and the fruit evenly and firmly packed."

PAPER MULCH FOR PINEAPPLE-GROWING.

A Nambour correspondent asks for further information on the use of paper as a mulch for pineapples, which appeared in the "Agricultural Gazette of New South Wales" for March last, and which we republished in the March issue of this Journal. As we have no details of the kind of paper used for the purpose, nor of its preparation, if any, for exposure to the weather, our correspondent might obtain further information by writing to the editor of the N.S. Wales Journal, Sydney.

TANNING RABBIT SKINS.

B. SCHNEIDER, Box 54, P.O., Stanthorpe—

Boil some wattle bark until it is of a thick, pasty consistence. Add enough water to make it the shade of brown required. Place the skins in this tan liquid, with the fur side of one resting on the skin side of the next, in layers, until all are covered. Leave them in the liquor for a fortnight or twenty-one days—the longer period for preference. Then take them out and peg them on a board, as when first dried. Leave them until thoroughly dry, and they will be fit for whatever use you may put them to. The skins should be of a good brown colour.

TO GET RID OF BLACK ANTS.

W. BILLINGTON, Warra—

(1) Try sprinkling shelves, &c., with oil of pennyroyal. (2) Wash with carbolic soap. (3) Dissolve a piece of ammonia the size of a hen's egg in one quart of water and brush the shelves with it. (4) Pour gasoline into their mounds (if outside) and set fire to it. (5) Lay carpet rag strings soaked in corrosive sublimate in their tracks. (6) Make the following mixture:—White lime slaked, 6 quarts; kerosene oil, ½ pint; turpentine, 1 wine glass; soft soap, 5 lb.; cowdung, 3 quarts; water, 16 quarts. This latter is suitable for washing fruit trees. None of these remedies is permanent, but will require repeating often.

COAL ASHES FOR THE SOIL.

W. BROWNE, Palmwoods—

Mr. J. C. Brünnich, agricultural chemist, in reply to your letter, advises that coal ashes have practically no manurial value. The application of coal ashes may help to loosen stiff soils, but, on red sandy loam, it may do some harm.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

Cotton crops are now fast approaching the final stages of harvesting. Growers are advised that all cotton in the Central District should be consigned to the Australian Cotton-growing Association, Rockhampton; whilst those in the Southern areas should consign their cotton to the Association at Whinstanes, Brisbane. All bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely

all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the Summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, freesias, snowflakes, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE COAST DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States, if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash, or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry, the tree should then be given a good watering, and when the water has soaked in, the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder, and if the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be

overcome by subjecting the fruit to artificial heat, as is done in the case of bananas during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay, or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bone dust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the Spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall they should be watered regularly. In fact, in normal seasons, an adequate supply of water is essential, as the plants soon suffer from dry weather, or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt Area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt Area which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district, and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manure—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when it starts growth in spring. Lime can also be applied where required. Badly-drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	APRIL.		MAY.		JUNE.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·2	5·50	6·18	5·20	6·36	5·3
2	6·3	5·49	6·18	5·19	6·36	5·3
3	6 3	5·48	6·19	5·18	6·37	5·3
4	6·4	5·47	6 20	5·17	6 37	5·3
5	6·5	5·45	6 21	5·17	6 38	5·2
6	6·5	5·44	6·22	5·16	6 38	5·2
7	6·6	5·43	6·22	5·16	6·39	5·2
8	6·6	5·42	6·23	5·15	6·39	5·2
9	6·7	5·41	6·23	5·14	6·40	5·2
10	6·7	5·40	6 24	5 14	6·40	5·2
11	6·8	5·39	6 25	5·13	6·41	5·2
12	6·8	5·38	6·25	5·13	6·41	5·2
13	6·9	5 37	6·26	5·12	6·42	5·2
14	6·9	5·36	6·26	5·12	6·42	5·2
15	6·10	5·35	6 27	5·11	6·42	5·3
16	6·10	5·34	6·27	5·10	6 42	5·3
17	6·11	5·33	6·28	5·10	6·42	5·3
18	6·11	5·32	6·28	5·9	6·43	5·3
19	6·12	5·31	6·29	5·9	6·43	5·4
20	6·12	5·30	6·29	5·8	6·43	5·4
21	6·13	5·29	6 30	5·8	6·43	5·4
22	6·13	5·28	6·31	5·7	6·43	5·4
23	6·14	5·27	6·31	5·7	6·43	5·4
24	6·14	5·26	6·32	5·6	6·44	5·4
25	6·15	5·25	6·32	5·6	6·44	5·4
26	6·15	5·24	6·33	5·5	6·44	5 5
27	6·16	5·23	6 33	5·5	6 44	5·5
28	6·16	5·22	6·34	5·4	6·44	5·5
29	6·17	5·22	6·34	5·4	6·44	5·5
30	6·17	5·21	6·35	5·3	6·44	5·6
31	...	...	6.35	...	...	...

PHASES OF THE MOON, OCCULTATIONS, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer Time" is not used.

			H. M.
5 April	☾	First Quarter	3 46 p.m.
12 „	○	Full Moon	6 44 a.m.
19 „	☽	Last Quarter	10 54 a.m.
27 „	●	New Moon	3 4 p.m.

Perigee on 10th at 6·36 p.m.
Apogee on 22nd at 8·12 p.m.

The moon will pass, apparently, close to Jupiter on the 11th soon after sunset. If viewed from a higher southern latitude the moon will be seen to occult the planet.

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4 May	☾	First Quarter	10	56 p.m.
11 „	○	Full Moon	4	6 p.m.
19 „	☽	Last Quarter	4	17 a.m.
27 „	●	New Moon	4	4 a.m.

Perigee on 8th at 5·12 p.m.
Apogee on 20th at 2 30 p.m.

On the 8th, between 11 and 12 p.m., the moon will be again very near, apparently, to Jupiter in the constellation Virgo, with the very interesting binary star—Gamma Virginis—slightly below them.

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3 June	☾	First Quarter	4	10 a.m.
10 „	○	Full Moon	1	38 a.m.
17 „	☽	Last Quarter	10	3 p.m.
25 „	●	New Moon	2	20 p.m

Perigee on 4th at 5·12 a.m. and on 29th at 1·24 p.m.
Apogee on 17th at 9·18 a.m.

The moon will pass Saturn on the 4th at a quarter past three in the afternoon, and will enable this planet to be seen in the daytime if a small telescope or binoculars are directed about six times the moon's diameter northward. It will also pass Jupiter on the 5th a little before four o'clock in the morning, again in apparent proximity to Gamma Virginis. Jupiter will again be occulted in high southern latitudes.

Venus, Jupiter, and Saturn will be evening stars during these three months. Mars will be somewhat later in rising, but will be visible early in the evening during the latter part of the period.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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THE CULTIVATION OF THE PEANUT.

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DESCRIPTION.

The Peanut, "*Arachis Hypogeia,*" also known frequently as the earth or ground nut, is a plant of annual habit, belonging to the natural order Leguminosæ or pod-bearers, and in common with most other members of the pea family has the power of obtaining its nitrogen supply from the atmosphere and storing it up in nodules on the roots.

Unlike other legumes, excepting the Bombarra ground nut, "*Voandzeia Subterranea,*" this plant, while blooming above ground, matures its pod or fruit under the surface of the soil. The yellow flowers are borne at the joints where the leaves are attached to the stem, in the bunch or upright varieties at the base of the plant, and in creeper or procumbent varieties right along the stems. Upon pollination taking place the flower fades, and falling off leaves the stalk with a thickened pointed end called the "peg" or "point," which grows down into the soil, where it matures into the pod or so-called nut. It is apparent from this that the soil on which the crop is grown should be of a soft or friable nature or such that a loose surface can be easily maintained.

RANGE.

The peanut can be grown over the whole of Queensland, and while in the cooler parts it only succeeds in summer, in the tropical portions it may be grown at any period of the year where a sufficiency of rain falls.

The period of growth ranges according to variety and climate from fifteen to twenty weeks, the longest period being taken up by the creeper or procumbent varieties.

A moderate rainfall, plenty of sunshine, and a comparatively high temperature best suit the crop, and departures from these may result in a more lengthened period of growth. The crop can also be grown under irrigation.

SOILS.

The nature of the soil on which the crop is grown, besides its fertility, is the main factor in a profitable crop. A loose texture is desirable to allow the pegs to easily penetrate and expand to form the pods and mature evenly, as well as to permit of easy harvesting in freeing the nuts from the soil. Good drainage is also essential, more especially when a heavy rainfall is liable to occur during the growing period.

Light sandy loams are best adapted for the production of peanuts for market as edible nuts, since the shells are clean and bright. Soils inclined to be clayey are apt to stain the shells, and though the berries or peas may be of equal quality, the clean, bright shell, being more inviting, will naturally command a better price. Ill-drained or sour soils are not desirable. Peanuts may be grown on most soils except a heavy or puggy clay, but except in the loose, friable soils they should only be grown for feeding off.

ROTATION.

Peanuts should always be grown in a rotation, as though owing to the roots being harvested the same quantity of nitrogen is not left in the soil as with other legumes, where the whole root system is available, a sufficient quantity of the nodule-bearing rootlets are left to exert an influence on the following crop. At Tolga, in a comparison with potatoes grown on land on which the previous crops were maize and peanuts, the yield on the portion previously cropped with peanuts was estimated by an official of the Department to be 9 tons of tubers as against 6 tons on that previously cropped with maize. In the rotation, however, the peanut, when harvested, should not take the place of the legume or other crop that is ploughed under to restore the organic matter in the soil, and should only be looked upon as adding a quantity of nitrogen. Where the whole growing plant is ploughed under it answers the same purpose as cowpeas, Mauritius, and velvet beans, &c.

In orchards, either as a crop to be ploughed under or to be harvested, the peanut is commended.

FERTILISERS AND LIME.

In common with other legumes, the peanut thrives best in a soil in which there is a sufficiency of lime. Not all soils require the addition of lime, but most soils in districts subject to heavy rainfall, and which give an acid reaction, will benefit by an application of from 5 to 10 cwt. of stone lime or 10 to 20 cwt. of earthy lime or pulverised limestone to the acre, broadcasted (not ploughed in), preferably a week or more before applying commercial fertiliser and sowing the seed. The cultivation of the crop will sufficiently work this lime into the soil. Where any doubt exists as to the necessity of applying lime to the soil, a portion should be limed and the resultant crop compared with a similar area unlimed.

In applying manures for the crop, care should be taken to only apply organic manure in a well rotted condition, and then only in small quantities and thoroughly mixed with the soil. Larger quantities or fresh manure will result in many of the pods being poorly filled. These poorly-filled pods are known as "pops" or "duds."

Organic manures should be applied to a previous crop to get the best results.

As the peanut is a legume and draws nitrogen from the air, this element is not called for in quantity in the fertiliser, but its presence in small quantity, say, 2 per cent. or 3 per cent., will be beneficial. Phosphoric acid and potash will be the chief elements in the fertiliser, and the quantities will be dependent on the soil content. In general, a fertiliser containing from 10 to 12 per cent. phosphoric acid, 2 to 3 per cent. nitrogen, and 6 to 8 per cent. potash will be a good mixture, and may be applied in quantities of from 1 cwt. to 5 cwt. per acre. Such a mixture can be obtained with 1 part sulphate ammonia, 7 parts superphosphate, and 1½ parts sulphate of potash.

The most suitable application will be discovered by applying varying quantities over a small area and noting results, but usually 2 cwt. is sufficient.

Commercial fertilisers are usually applied immediately prior to planting a crop, and as the roots of the peanut do not spread to any distance, the application in the drill with a fertiliser distributor having one or two tines at the back will greatly aid in mixing the fertiliser with the soil.

Ashes from the forest hardwoods, which contain lime and potash, are useful, and may be applied to the soil broadcast in a similar manner to lime at the rate of about 10 cwt. to the acre. These ashes, however, should not previously have been exposed to rain, as then a great deal of their value will have been lost. The ashes of soft woods growing in the scrubs are not considered so good.

SELECTION OF SEED.

As with other crops, in order to secure the best results it is essential that the seed of the peanut should be of the highest grade. Poor seed cannot be expected to yield a good return. In the first planting, seed should be secured from a heavy producing crop and subsequently carefully selected in the field from the heaviest producing plants of the required type. A good plan is to select the nuts from the best producing plants and sow these in a special seed patch, each year selecting the best of this area for next year's seed patch. Nuts harvested for seed should be fully matured, handled carefully, and not picked from the plants for several weeks after curing; they should then be picked by hand and the selected ones thoroughly dried and stored in a dry place free from mice or insect attack. Storage in tanks in a similar manner to maize is most satisfactory.

METHODS OF PLANTING.

The seed can either be planted whole or shelled. Whole nuts may be soaked in cold water twelve to twenty-four hours, drained, dried for an hour or two to assist handling, and then planted. This accelerates germination. Shelled seed should not be soaked.

Where shelled seed is used the shelling should be done by hand, though hand shellers carefully handled are sometimes used. All shelled seed in which the thin skin covering the seed is broken should not be sown, as this injury is liable to affect germination.

Breaking the pods in two answers the same purpose as shelling. Where the seed after planting may be subject to attack by vermin, the seed may be treated by sprinkling with a solution of equal parts of stockholm tar and kerosene. In this case, however, to protect the maturing crop it is advisable to destroy, by poisoning, the vermin beforehand.

Whether planted whole or shelled the operation may be effected by hand or with planters especially designed for the purpose.

AMOUNT OF SEED.

The amount of seed required to plant an acre is about 40 lb. of the whole nuts and from 25 to 30 lb. of whole nuts shelled, varying slightly according to the weight of the nut and the distance apart they are planted. Some growers use as much as 60 lb. per acre of the large podded varieties. It is interesting to note that the whole nut, when planted, provides but one plant, but if shelled and the kernels planted apart, two plants will result.

TIME OF SOWING.

According to the climates of the various districts, so will the time for planting vary.

In the cooler districts, sowings may be made when all danger of frosts is over and the soil can be expected to be reasonably warm, September, October, November, and December being suitable months. In the tropics the crop can be grown practically throughout the year, but consideration must be given to climate and rainfall—*i.e.*, sufficient rainfall should be obtained to grow the crop and fine weather be expected at harvest time.

In the tropical portions of the State, where the monsoonal rain or wet season commences in December, the main crop is sown in January, February, and March, according to the likelihood of reasonably fine weather in the months of April, May, and June or July, when harvesting should occur.

In planting large areas it is recommended to spread the sowings over such a time as will allow of harvesting one lot before the next is over-ripe. Peanuts left too long in the ground are easily detached from the plant and consequently more difficult to harvest, while some varieties are liable to sprout.

LENGTH OF CROP.

The large nuts or creeper varieties require a longer time for growth to maturity than do the bunch or upright varieties, the time varying from fifteen to seventeen weeks for the bunch varieties and from seventeen to twenty weeks frequently for the creeper variety.

PREPARATION OF LAND.

In preparing the land for peanuts the first ploughing may be deep, but the second should not be deeper than 6 in., preferably 5 in. This top 5 in. should be brought to a fine tilth and be free from weeds and trash.

Where lime or ashes have been applied the land is harrowed and drills drawn out, in which the fertiliser, if any, is mixed and the peanuts sown either by hand or with the planter. The drawing of drills may be done with the fertiliser distributor, or the whole operation can be done with a seed drill and fertiliser distributor combined.

Where no seed drill or fertiliser distributor is obtainable, the drills could be drawn out with a cultivator having a wide shovel attachment in the rear, the fertiliser dusted along this by hand, the cultivator then run along the drill with tines set close in front to mix the fertiliser with the soil, and the shovel attachment set at the back to reopen the drill for the reception of the seed to be dropped by hand; this drill should not be deeper than 4 in. from the levelled surface of the soil, and the seed should be covered to a depth of 2 to 3 in., according to the texture of the soil and its moisture content. In light soils where evaporation is great the deeper planting is preferable, but in stiffer soils the shallower covering should be adopted.

A light firming of the soil over the seed is desirable, and this is obtained in the seed drill by a wheel at the rear. When planted by hand the area may be covered with the harrow, or preferably by the cultivator, with tines straddling the drill and set so as to throw the soil inwards.

TIME OF GERMINATION.

Germination usually occurs with shelled nuts in five days, but is subject to the amount of moisture and heat in the soil. The whole nuts take longer unless first soaked in water, as the moisture has to penetrate the shell to affect the berry or pea which contains the germ.

SPACING.

The intervals between drills and the spacings between seeds in the drills vary somewhat, according to the richness of the soil and the variety planted.

The bunch or upright varieties take up much less room than the creeper or procumbent kinds, and the growth of both is correspondingly greater on the richer soil.

In general, the drills are drawn out from 30 in. to 42 in. apart, the distance being influenced by the space required by the cultivating implement.

The spacing of the seed in the bunch varieties may be from 6 to 12 in. apart, and of the creeper varieties from 12 to 24 in. apart in the drill. An instance of success with close planting is noted from an experiment in which, in a light sandy loam, the bunch varieties were planted 3 in. apart in drills 30 in. wide. It is thought, however, in richer soils this crowding of the plants would be detrimental.

CULTIVATION.

Where close planting has been adopted the land may be harrowed with a light harrow shortly after the plants appear through the surface. Otherwise it will be better to use the cultivator between the rows and the hand hoe, where necessary, between the plants. The first one or two cultivations should be done with fine points, as in the strawberry cultivator or the 1½-in. or narrowest shovel points supplied with the usual 5-tooth cultivator; after this the broader points can be used and later the hilling attachments. In early cultivations the cultivator can work close to the roots, but not deeper than 2 in.; but later, after flowering, when the pegs enter the soil care should be taken that the plant is not disturbed.

In most soils it is desirable to draw a little of the soil in towards the plant to provide a bed of fine earth in which later the pods may form, and this can be done at each cultivation, finally leaving a flat bed in which the plants are growing with a water furrow between each drill. The height to which hilling may be practised depends largely on the soil. Usually, the heavier the soil the more necessity for hilling.

Soil should not be thrown on the centre of the plant, the object of hilling being to provide fine soil for the pegs to enter and mature evenly and for ease in harvesting. As a rule, in the creeping varieties the pegs easily reach the soil, but in certain cases a light roller run over the crop will facilitate this operation. In the bunch or erect growing varieties no rolling should be attempted, but a final higher hilling made if it is noticed the points have some distance to go to reach the soil.

HARVESTING.

The time for harvesting is noted in the appearance of the foliage, which starts to yellow or lose colour, and by examination of the nuts. If the majority of the berries or peas are full grown and the inside of the shell has begun to colour and show darkened veins, the crop is mature and harvesting should not be delayed.

If the crop is harvested too early the proportion of "duds" is very great, while if deferred too long some of the nuts may germinate and others become detached from the plant when lifting, while the tops, having lost most of the leaves, will be of much less value for fodder. In some soils, notably the friable chocolate volcanic loams, the plants may be lifted by hand, when most of the nodule-bearing rootlets are left behind and only the root stock with the nuts are lifted. In other cases it is necessary to loosen the soil before lifting out. In small areas this is sometimes done with the digging fork inserted under the plant, which is lifted while the fork is worked underneath. In large areas a potato digger with an endless belt elevator from the shovel point is found very effective where the soil is dry enough to fall through the slats of the elevator and the crop is free from weeds.

A very satisfactory digger could, however, be made on the farm or by a local blacksmith by attaching to an ordinary wooden plough beam a knife edge to go under the plant and cut the roots just below the nuts; finger bars at the rear of this knife edge would lift the plants and loosen the earth, thus facilitating the lifting by hand. The width of the knife edge should be sufficient between the attaching portions to

the beam to allow of the whole plant passing through, and the depth should be regulated by the wheel or wheels in front. Perhaps a better idea might be given by taking the back off an ordinary earth scoop, together with all the bottom excepting 6 in. in front, and substituting finger bars slightly elevated to carry the plants and attaching the whole to a plough beam with handles. In a digger of this description, where one horse was used, the digging attachment would be to one side of the beam, while with two horses it would be in the centre, the operator straddling the row and the depth regulating wheels being preferably two, one on each side of the line of plants.

Where an ordinary plough is used the share should cut 10 or 12 in. wide and the mould board removed and some rods substituted to prevent the tops being mixed with the soil.

It should always be remembered that the cutting of the roots as close to the pods as possible results in the greater quantity of nitrogen being returned to the soil.

Harvesting should not begin until the dew is off and the tops are dry, and the operation should be regarded as a hay-making of the tops, and not more than can be handled should be lifted in any one day.

CURING.

After the plants are lifted and the soil shaken from the nuts they are allowed to lie either spread on the ground or in small bunches until the leaves are wilted, but not curled or brittle. They are then bound in small sheaves or taken separately and stacked until cured. The time in which the plants are allowed to wilt varies according to the weather, and in some cases stacking may be necessary within an hour of lifting.

The usual method of curing peanuts where the quantity is large is to place them in small stacks around a pole. From twenty to thirty poles will be required for an acre.

These poles should be reasonably stout, from 2 to 3 in. of hardwood in diameter at the bottom end, which should be sharpened. When erecting, holes are made in the soil with a crowbar, post-hole digger, or earth auger, and the pole inserted or driven down with a mall to a depth that will ensure their not being blown over with the weight of the stack upon them. Crosspieces about 3 ft. in length are now nailed across the post at right angles, one immediately above the other, 9 to 10 in. above the level of the ground; 3 by 1-in. hardwood battens answer the purpose admirably. According to the crop, six or seven rows are taken on each side of the poles, and the plants, when wilted, forked into one row on either side of the pole. When stacking, a few vines are placed across the crosspieces, which keep them off the ground, to form the foundation. The vines are then stacked by hand with the nuts next to the pole and tops outward, pressing down each layer and building evenly around the pole. From time to time a bunch should be divided and hung around the pole to bind the mass and to assist in keeping the centre high.

This latter is important in that it allows any rain falling to run off. When the stack is approaching 3 ft. high the vines should be drawn closer round the top and finished off with a cap of grass as a thatch to run rain off. It is important that free circulation of air should obtain through the stack in order to facilitate curing. The building of thick or high stacks or pressing them too tight will tend to cause heating, with consequent damage to both fodder and nuts.

After about two weeks in the stack the peanuts may be stored in the barn, but the nuts should not be picked from the vines until preferably six weeks from the date of harvesting, as if picked too soon they are liable to shrivel, and there is danger of fermenting or moulding after picking.

PICKING.

The usual practice in this State has been to pick the nuts from the cured plants by hand—a tedious process, the cost of which, if the ruling rate of wages were paid, would be prohibitive, since 60 lb. is considered a fair day's work. This practice of hand picking has been followed for ages, and is still the usual method adopted in countries such as India, China, Japan, &c., where labour is plentiful and cheap. In certain cases, too, the nuts are washed by agitation in frequently changed water and dried in the sun to obtain a clean inviting article for edible purposes. This is necessarily a costly undertaking, and would need a much higher price for washed nuts to compensate.

Other methods adopted in North Queensland with a lessening of expense have been, in the case of the bunch nuts, to hold the stems in the hand and thresh the nuts off by beating across tightly-drawn wires or the edge of a board placed midway across

a box or other receptacle to hold the nuts, and with both bunch and creeper to rub the whole plant over a wire netting drawn tight until the nuts fall through. Subsequent winnowings remove trash and light pods, and it is stated thoroughly drying the resultant nuts in the sun will cause the stems or tails to break off in the bags, resulting in a clean sample when it reaches the market.

In other lands, however, labour and time saving machinery has been evolved which does very satisfactory work in picking, stemming, cleaning, grading, and bagging for market, without breaking or damaging any appreciable quantity of the pods.

Two types of pickers are on the market in the United States of America—one working on the principle of a cylinder grain-thresher and the other one in which the plants are drawn between spring points over a wire mesh in such a manner that the nuts are pulled off and fall through on to a conveyor, which carries them through a winnowing process to a stemming apparatus, after which they go through a further winnowing and a cleaning and grading process. Two machines of the latter type are in use in the Cooktown and Tableland districts respectively.

The cost of machines of this description is too great for the individual in most cases, and it would be advantageous, where any considerable area was under crop, for farmers to co-operate in the purchase, when the machine, which is on wheels, could be transported from farm to farm.

Contract picking is a feature in the United States just as contract chaffcutting is in Australia. The picking crew, working day after day, naturally become expert; so that a greater average quantity is handled daily with less damage than when novices or hands out of practice are engaged.

When a power-driven picker is in use it is advantageous to place it in a central position in the field where the poles with the stacked peanuts can be transported bodily to the machine, resulting in less handling. With suitable uprights with a cross bar attached to the dray a lever with a grip attached to the top of the pole and passed over the cross bar would use it as a fulcrum, when the long end of the lever being lowered to the shaft would lift the pole entirely clear of the ground, allowing of its quick and easy transport to the picker.

The stems or vines of the plant, after the nuts are detached by the picker, can be stacked, baled, or chaffed and used for forage purposes, while the "dud" nuts (small or immature) can be fed to stock.

MARKETING

The nuts are usually bagged whole and shipped to the buyer, but where freights are high it is sometimes more remunerative to market the kernels only.

Special machinery is available to shell peanuts with a minimum of damage to the kernels. Bruising of the kernel at shelling or during transport is injurious, as decomposition is liable to set in and rancidity occur

Shelled kernels should also be absolutely dry before packing for the same reason. Each variety should be kept distinct, whether shelled or unshelled, as oil millers are understood to give lower prices when the kernels are of different colours.

DISEASES.

The peanut is seldom subject to disease when grown under proper conditions of soil and drainage. The most common disease noticed in Queensland is a form of leaf spot (*Cercospora* sp.) which appears as brownish spots on the leaves and is most frequent on sour or poorly drained land. When this appears late it will be possible with the upright growers to mow the tops and make hay before they are too far gone. Another disease that has been noticed on occasion is a kind of fungus attacking the stem where it enters the ground and is characterised by a cobwebby appearance, due to the mycelial threads of the fungus on the stem just below the surface, together with the appearance of minute round white or brown bodies the size of mustard seeds, which are the spore cases of the fungus. A proper system of drainage, together with liming and a rotation of crops, will minimise disease in the peanut as with other crops.

PESTS.

Insect pests are of infrequent occurrence, so far the only attack noticed in the State being odd instances of mealy bugs on occasional roots.

Vermin are very partial to the nuts, as are many birds outside those domesticated.

The duty recently imposed by the Commonwealth on peanuts and peanut oil is as follows:—On peanuts from the United Kingdom, 2d. per lb.; other British countries, 3d.; foreign countries, 4d. On edible oils, which include peanut oil:—From United Kingdom, 2s. per gallon; other British countries, 2s. 6d.; foreign countries, 3s.

The protection afforded by this tariff should compensate for the additional costs in growing under white labour conditions in Australia, and peanuts should become a staple crop in North Queensland.

YIELD.

The yield of the peanut crop will, of course, depend on the fertility of the soil, amount of rainfall, and attention bestowed.

While it will bear a satisfactory crop under a small rainfall, showing to an extent that it is drought resisting, it is not injured by excessive rains provided the soil is well drained. An instance of this was observed at Banyan in 1921, where a perfect sample of the Red Cross variety was seen which had experienced a fall of 120 in. of rain in the growing period.

Crops on a small scale have been estimated to produce 3 tons to the acre, and in the North field crops averaging 1 ton and over are not uncommon; but as a general rule, in satisfactory soils and under ordinary conditions with proper cultivation, 15 cwt. per acre might be expected as a fair average yield.

Where the crop grows to perfection, as at Cooktown and the Tableland, there is a fine opportunity for the institution of a co-operative oil mill and the purchase co-operatively of labour-saving machinery in picking, &c. In the growing of peanuts for marketing as whole nuts, it frequently happens that the product is not readily saleable owing to stained shells, glutted market, or other causes, when the presence of an oil mill will be advantageous.

The districts mentioned are in a particularly good position for the establishment of an oil mill, since freight on the whole nuts to the Southern parts is high and a ready market for the cake is to be obtained from the dairymen and pig-raisers near at hand.

THE PEANUT.

As a commercial crop the growth of the peanut in Queensland has not been favoured to any extent during past years, since, according to departmental statistics, the areas under cultivation and yields were:—1919: 153 acres; yield, 127,708 lb.; average per acre, 835 lb. 1920: 272 acres; yield, 274,916 lb.; average per acre, 1,011 lb. 1921: During these years the amount of nuts imported into Australia of various kinds, including peanuts but excluding almonds, was:—1919: 3,998,314 lb.; value, £96,056. 1920: 6,955,646 lb.; value, £271,087. 1921: 4,959,771 lb.

It is unfortunate that the peanuts, when imported, have been included with other edible nuts such as Brazil, Barcelona, walnuts, &c., so that accurate figures are not obtainable, but it is certain that a goodly proportion of the quantities enumerated can be credited to peanuts.

The imported unshelled nuts may be said to be wholly, and the Australian grown to be almost wholly, used for edible purposes in the parched form or in confectionery.

This use of the peanut, though it is capable of expansion, cannot be said to offer very great inducement to largely increased areas in the State; but when the other uses are considered there is every inducement to push the industry of peanut-growing forward.

A report, culled from the "American Trade Review," states that Professor Carver, Chief of the Research and Experiment Station at Tuskegee Institute, U.S.A., exhibited before the Ways and Means Committee of the House of Representatives at Washington, D.C., over 100 varieties of products from peanuts, including oils, milks, butters, flours, meals, breakfast foods, relishes, sauces, flavourings, many kinds of confectionery and prepared nuts, wood stains; different kinds of stock foods prepared from the nut and vine; and also a black ink and a face powder and face cream.

This is interesting as denoting the diversified uses of the plant; but at present the commercial uses may be briefly summarised as:—

The whole plant as a stock food either to be harvested, stored, and used as required or to be fed off;

The plant, exclusive of the nuts, cured as hay, in which it is close to lucerne in food value, and fed to stock;

The nuts for edible purposes, either whole, parched, or salted, or shelled, and used in confectionery;

The nuts for oil;

The residue after extracting the oil, in some cases, for edible purposes, but mainly for stock food or as manure.

The whole plant when used as a stock food has proved of great value in pig-raising either by being fed off or harvested and stored for use. With the upright or bunch varieties the tops are frequently mown for hay, and, after this has been carted off, the pigs turned in to harvest the nuts. Comment has been made on the effect of the nuts producing a soft pork, especially when such is the main diet. The addition of other foods, especially when topping off, should to a large extent overcome this. No difference can be noticed in the appearance of the peanut-fattened pig and one fattened on corn; and if the corn is not intended for bacon, no lowering in value need be expected. The foregoing applies mainly to crops fed off; but where the crop is harvested and the nuts or a portion marketed as such, no objection is raised.

In the form of hay, as the whole plant less the nuts is called when cured, the peanut affords a valuable fodder, which is rich in protein and rivals lucerne in feed value. The following analyses are instructive as a comparison between peanuts and lucerne:—

—	Total Dry Matter.	DIGESTIBLE NUTRIENTS IN 100 LBS.				
		Crude Protein.	Carbo-Hydrates	Fat.	Total.	Nutritive Ratio.
Lucerne	91·4	10·6	39·0	0·9	51·6	1 3·9
Peanut Vine	78·5	6·6	37·0	3·0	50·4	1 6·6
Peanut Vine with Nuts	92·2	9·6	39·6	8·3	67·9	1 6·1

In palatability, probably the peanut hay is ahead of lucerne, as stock greedily eat the hard, sun-dried stems no matter how long exposed.

In feeding the hay or the whole cured plant to horses and cattle, the receptacle should allow of any soil adhering to the roots falling through; and the danger in feeding mouldy peanut hay is the same as with mouldy hay of any other kind.

The nuts as used for edible purposes are familiar to all, and, before the plague restrictions, were probably most familiar to the frequenters of music-halls and picture-shows.

Washed or brushed nuts with a clean, bright shell are naturally sought for this trade, the larger nut being most in demand—not that it is more palatable, but probably because being larger, and the berry not so full, it is easier shelled; still another reason is that, bulk for bulk, it is lighter than the bunch nut, and being sold by measure goes further.

Prepared for sale as whole nuts, the process is either to salt or to parch by exposure to a fairly high temperature without, however, scorching the shell.

In confectionery, the peas or kernels only are used, and are first blanched by removing the thin outer skin and degermed. They are used in place of almonds as icings, toffees, rocks, and in other ways too numerous to mention.

The blanched and degermed berry is also roasted and ground to make peanut butter, salt being added to flavour. See "Queensland Agricultural Journal," February, 1921, page 77.

The chief value of the peanut is as a source of oil; and this oil is the most important of the world's food oils. In past years the production of peanuts was largely confined to India, China, and other tropical parts of Asia; but now large acreages are planted in Africa and America. As illustrative of one country's increase in production, the average annual export of the British colony of Nigeria during the five-year periods ending 1905, 1910, 1915, and 1920 was 513 tons, 1,572 tons, 9,778 tons, 48,500 tons; the greatest quantity shipped in one year being 57,554 tons (Bulletin Imperial Institute Vol. XIX No. 2). In the south of the United States, peanuts first became commercially important in the year 1870, and gradually increased in importance up to 1900; since when the industry has expanded enormously. In 1889 only 3,588,143 bushels of nuts were produced (U.S. standard bushel = 22 lb.). The production increased to 12,000,000 bushels in 1911, and to over 40,000,000 bushels in 1917, in which year the area under crop was over 2,000,000 acres. Up to 1914 peanut oil was not imported or produced to any considerable extent; but, in 1916, 2,000,000 gallons of the oil were imported and 3,488,649 gallons were produced in the country, mostly from the shelled nuts (Year Book, U.S. Department of Agriculture 1917).

In France, at Marseilles, enormous quantities of peanuts are imported, both whole and hulled, from which many millions of gallons of oil are expressed, something like an average of 40,000,000 gallons being produced yearly, prior to the war.

Peanut oil in bulk is known to the trade as China oil.

Under this heading Commonwealth imports are given as in 1919: 107,742 gallons, valued at £34,215. 1920: 47,820 gallons, valued at £20,276. 1921: 58,966 gallons.

The finer grades of oil are included with various other vegetable oils in small containers, and the quantity cannot be arrived at; but the total values of this class of oil imported were—In 1919, £28,327; and 1920, £36,502.

The total values of the importations is not very great; but the various uses to which the oil can be put would create a market, if locally produced, far in excess of these figures.

Amongst the uses of the oil are—Finest oil as salad oil and for use in medicine, the arts, and as a lubricant for high-speed journals in delicate machinery, &c.; first quality grade for cooking, and in the manufacture of margarine; also as a lubricant and harness-dressing, &c.; lowest quality grades for soap-making and other industrial purposes.

Peanut oil is generally used in the cooking of sardines and other fish sold in oil, as olive oil will not stand the high and continuous heating necessary: The fish are first cooked in the peanut oil; then drained, put in cans, and the cans then filled with olive oil. For much the same reason peanut oil is preferred by cooks to olive oil in other branches of cookery. The oil is also becoming popular with manufacturers of lard substitutes, who harden the oil by hydrogenation.

The extraction of the oil from the nuts is a simple process, and entails less procedure and machinery than other oil-products. The bulk of the oil is obtained by simple pressure, and the balance on heating and again subjecting to pressure.

In the United States more attention has been paid to special machinery for the expression of peanut oil than elsewhere, though cotton-oil mills have in many cases been adapted for the purpose.

The "Expeller" system, it is claimed, reduces the amount of machines to a minimum; the one machine extracting the oil in two operations—one cold, and the other after heating the residue from the first pressing. Other systems require the nuts to go through a series of crushing-rolls first, and then through hydraulic presses, when, the first oil being expressed, the meats are broken up, heated, and pressed a second, third, and sometimes a fourth time.

In preparing the peanuts for oil expression, they are first put through grading and cleaning machinery to get rid of unfilled nuts, dirt, and other foreign matter.

The nuts may be treated either whole or shelled, the latter always being the case when the highest grade oil is required. Special machines are in vogue for shelling, blanching, and degerming.

When preparing for high-grade oil, the shelled kernels are passed over a picking-table on a slowly moving belt, alongside which are seated operators who pick out any trash or bad nuts not removed in the previous cleaning process.

The blanching process consists in removing the thin skin covering the kernel. This skin contains about 13 per cent. of oil, and is included with the material when expressing the lower-grade oil. The blanching machine consists of a set of brushes revolving against a corrugated plate. When most of the skins are removed, the kernel separates into halves, and the germ becomes loosened.

The meats are then separated from the skins and germs by passing them over screens in front of a fan. The skins are blown out, and the germs fall through the screen, which should have round holes about ¼ in. in diameter. The germ is added to the material for lower-grade oils, as the oil it contains is of lower quality than that of the rest of the kernel.

From the blanched degermed kernels the highest grade of oil is obtained; this is practically colourless and inodorous, possessing a pleasant, nutty flavour, which commends it as a salad oil. In certain cases the oil is further refined by passing it through charcoal filters.

The various grades of oil command prices according to their degree of purity. Oil expressed from whole nuts may be refined; but the highest degree of purity is obtained as outlined in the expression from shelled nuts.

The presence of damaged kernels will lower the quality of the oil. For ease of transport, nuts are frequently shelled before marketing, and, unless thoroughly dry, are apt to heat, causing the presence of a free acid in the resultant oil. In analysis this is expressed as an acid value, being the number of milligrams of caustic potash required to neutralise the acid in one gram of oil.

The resultant cake or meal after the expression of the oil from the shelled nuts is used for the preparation of human foods as meals, flours, and breakfast foods, &c., and also as with the cake formed in the treatment of the whole nuts as a stock food or fertiliser.

An average analysis of peanut oil cake shows, according to Henry and Morrison:—

—	Total dry matter in 100 lbs.	DIGESTIBLE NUTRIENTS IN 100 LBS.				Nutritive Ratio.
		Crude Protein.	Carbo-Hydrates	Fat.	Total.	
From whole nuts ..	94·4	20·2	16·0	10·0	58·7	1 1·9
From shelled nuts ..	89·3	42·8	20·4	7·2	79·4	1 0·9

The feed value of these products is at once apparent, and, viewing the richness in protein as evidenced in the nutritive ratio, it becomes most valuable as a concentrate for addition to stock foods in making a balanced ration.

For oil production the bunch or upright varieties are favoured, especially the Red Cross. These varieties, having an upright growth, also lend themselves to a mowing of the tops, and, as well as being easier harvested, yield a heavier crop of nuts than the creeper or procumbent varieties.

A MARKET FOR PEANUTS.

One of the objections, from the producer's point of view, to the peanut as a crop has, up to now, been the impossibility of disposing of the culls—that is, the small, broken, discoloured, and shrivelled nuts unfit for either the roasting or confectionery trade; but this has been overcome now by the establishment of an oil mill at Marrickville, Sydney, which will provide an outlet for these culls, which can be used for oil crushing.

The price for oil milling nuts will naturally be world's parity, as otherwise it would be impossible to successfully compete with imported oil. It is realised that the world's parity price for milling nuts for the whole of the growers' crop would not be a paying proposition to the farmer, and to ensure a full return to the producer the milling company will receive locally-grown nuts, which will be graded for (1) confectionery trade, (2) roasting trade, (3) culls, which will go to the mill for oil crushing.

The Australian-grown nut must compete with the Chinese nut, which arrives here perfectly graded and nearly 100 per cent. usable for the purpose for which it is bought; consequently the successful marketing of the local nut depends entirely on the establishing of a grading house for handling the nuts on the lines indicated above.

The Australian grower is very handsomely protected with a tariff of 4d. per lb. for peanuts in the shell and 6d. per lb. for peanut kernels. In the United States, America, the peanut industry has grown into huge dimensions, competing successfully with the Chinese nut on a protective tariff of three-eights of a cent. per lb. on nuts and three-quarters of a cent. per lb. on kernels. The American tariff, as compared with the Australian tariff, is as follows:—Peanuts in the shell: America, £1 14s. 6d. per ton; Australia, £37 6s. 8d. Kernels: America, £3 9s. per ton; Australia, £56. The effect of the heavy Australian duty has been to curtail the sale of peanuts. There was at one time a big trade for children's "penny bag" peanuts, but the small quantity which can now be purchased at this figure is not attractive. If the Australian grower takes the full advantage of the tariff protection, this state of affairs will continue. The nuts will be graded by the company into (1) confectionery, (2) roasting, (3) milling. The advantage of the protective tariff can only be looked for on grades 1 and 2, as the price of milling nuts will be regulated by world's parity and the local price of imported oil. Even in the milling grade the Australian grower will have the advantage in price over imported nuts to the extent of the freight, &c., from outside markets.

To obtain the best results—that is, a high percentage of confectionery nuts—the farmer should make certain that the soil, climate, and rainfall are suitable and proper methods of cultivation adopted. Advice on these points can be obtained from the Department of Agriculture. Another point of importance is the selection of a variety and type of nut suitable to the district, and the class of trade for which the grower proposes to cater. For the roasting trade the large nut known as the China is most suitable. The Valencia nut, which is not quite as large as the China, but carries almost as big a kernel, is most suitable for the confectionery trade, while the variety known as the Spanish is the best for milling, as it contains a very high percentage of oil, and the crop from this variety is the more prolific. This nut, owing to its flavour, is also fast growing in popularity with the confectionery trade.

The plant installed at Marrickville is capable of handling 2,000 tons per annum, but with slight additions the capacity can be doubled. The principal objection to the peanut crop—that is, the impossibility of disposing of the culls—is, through the establishing of this mill, now overcome, and the crop should be well worth the consideration of farmers where the soil and climatic conditions are suitable.

REINFORCED CONCRETE TANKS.

SPECIFICATION FOR CONSTRUCTION ABOVE GROUND.

Excavation.—Excavate for floor of tank as shown. Excavation to be cut to the neat dimension and surface well tamped to form a solid foundation. Any filling-in required is to be done with broken stone tamped so as to form a solid foundation.

Reinforcement.—The reinforcement for floor and sides should first be put together and the reinforcement for top of tank prepared so that it can be put on immediately plastering of walls is near completion. Floor reinforcement to be placed as shown, about three-quarters (¾) inch from underside of concrete bottom of tank. Then place expanded metal all round sides of tank, fixed horizontally to light skeleton framing and locked according to manufacturer's directions. All this reinforcement is to be securely bound together with number sixteen (16) gauge wire so as to form a rigid frame. Reinforcement in top of tank to consist of expanded metal in single lengths across top of tank, locked together as before, cut and bent over into sides of tank and wired together. Form circular manhole as shown. Remove skeleton framing before inside plastering is commenced.

Temporary centring of three-quarter (¾) inch boards is to be used to support top until cement is set.

Concrete Floor.—Floor of tank to be of concrete five (5) inches thick. Concrete is to be composed of four (4) parts stone, broken to pass through a three-quarter (¾) inch ring, two (2) parts clean sand, and one part Portland cement. It shall be mixed on a wooden platform, turned over twice (2) dry and three (3) times while water is poured on, and thoroughly incorporated, and must be used quite fresh. Concrete to be well settled around reinforcement and the whole floor well tamped.

Cement Plaster.—Walls and top of tank to be formed of cement plaster one and a-half (1½) inches thick, composed of one (1) part cement to two (2) parts clean sharp sand. Care must be taken in mixing the plaster to make it of the exactly right consistency, as no cement or sand must be added for drying and no water added for moistening whenever the plastering is commenced.

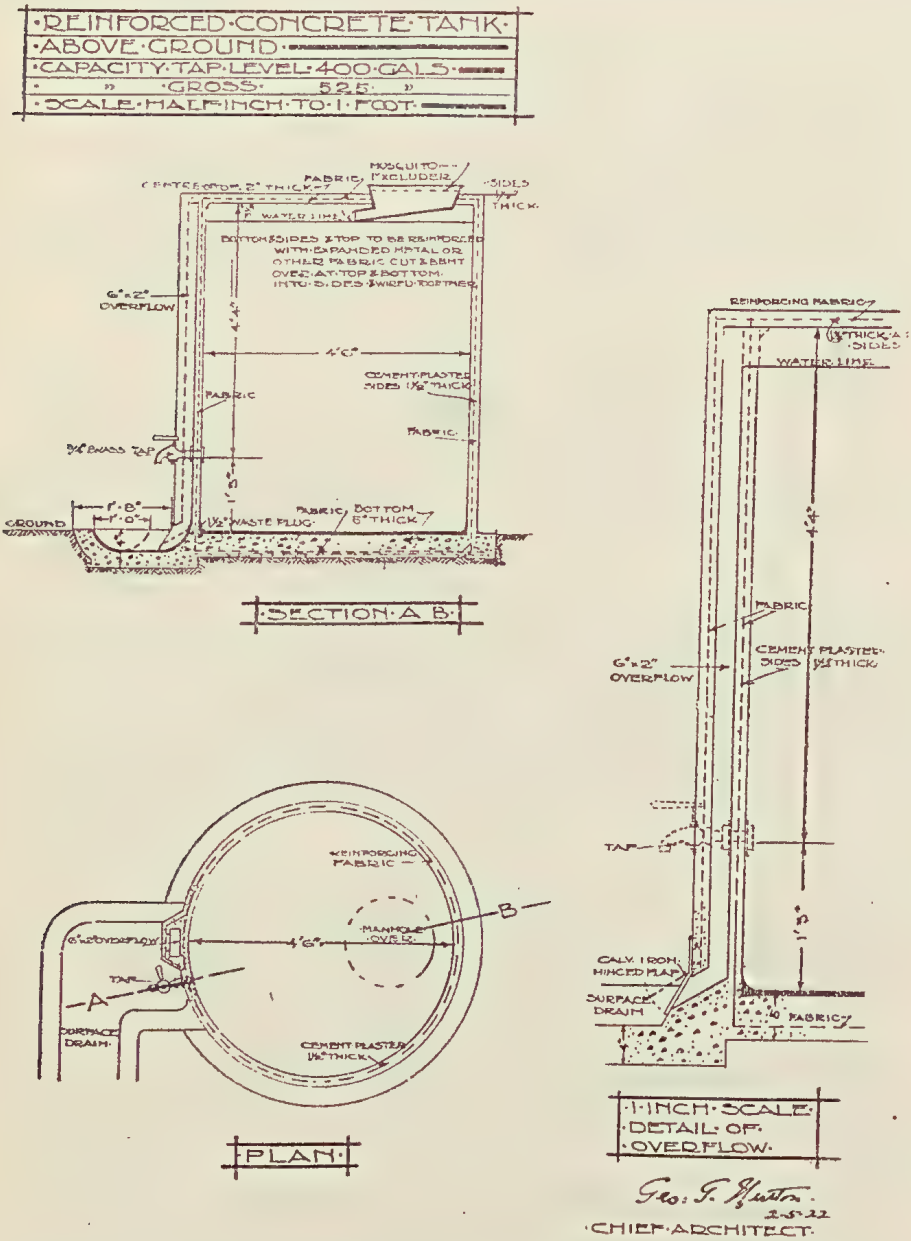
Render the floor of the tank with cement similar to the above three-quarter (¾) inch thick.

NOTE.—Top of tank to be two (2) inches thick in centre, weathered to one and a-half (1½) inches at sides.

Waterproofing.—All concrete and plaster to be mixed with "Toxement" or other good waterproofing compound, mixed to manufacturer's instructions.

Construction of Tank.—The concrete and cement portion of tank must be completed in one operation, and no initial set must be allowed to take place in the cement before any unfinished edge of plaster is carried on. The holding capacity of the tank depends entirely upon the tank being made monolithic, and the importance of this must not be neglected. The concrete floor should be started immediately on commencement of work in the morning. As soon as the floor is laid the plasterers must start, so that the junction between wall and floor shall be continuous. As many plasterers as can conveniently work must be put on, working together inside and outside the walls, and care must be taken that the cement is well filled into the reinforcement. As soon as the walls are completed to the top of the tank a layer of cement is to be placed upon the centring and the expanded metal for top, which should be ready for

immediate use, must be placed, and the top of the tank plastered as before. The whole of the plastering shall be completed in one operation and worked to a smooth and even surface inside and out, and all angles should be rounded or filletted.



Overflow.—Provide collapsible core from overflow of two (2) inch pine in three (3) pieces wedge-shaped, and remove same when concrete is set. Care to be taken that parts of core to be withdrawn from lower part of overflow be so made that they will easily pass through hinged flap. Leave opening in top of tank, both in concrete and expanded metal, about six (6) inches diameter, with bevelled edges, immediately over overflow, so that upper part of core can be withdrawn. Fill in opening flush when core has been removed. Build in galvanised iron frame and hinged flap at bottom as shown.

Tap and Cleaning Plug.—Provide and build in, where shown, a three-quarter (¾) inch low pressure brass tap, also one and a-half (1½) inches diameter cleaning plug. Tap to be fixed in position before plastering is commenced, and plaster worked up close all around same where it passes through wall of tank. Pipes passing through

walls of tank to be threaded full length. Put circular metal washer on outside under tap and cap to clean out pipe, and screw up tight.

Mosquito-proofing.—Provide and fix mosquito-excluder to manhole in tank.

Drain.—Form drain under tap as shown and properly connect to surface drain.

Keeping Damp.—Keep the whole of the concrete and plaster walls damp, both inside and outside of tank, for at least fourteen (14) days after completion, keeping tank well covered with old sacking during that time.

Removing Centring.—Remove centring at the same time that sacking is removed.

NOTE.—All centring, especially core for overflow, to be given a good coat of soft soap before plastering is commenced.

Cleaning out.—Thoroughly clean out the inside of the tank at completion.

SPECIFICATION FOR CONSTRUCTION UNDER GROUND.

Excavation.—Excavate for tank as shown on drawings to neat dimensions with clean cut sides and well tamped at bottom to form a solid foundation.

Bottom of excavation to be level and sides plumb and free from loose earth.

Concrete Work—Materials.—

Sand.—To be first quality fresh water deposit, sharp and coarse; clean and wash if necessary so as to be free from all impurities.

Gravel.—To be best river gravel procurable or clean broken hardstone to pass through three-quarter (¾) inch gauge and free from dust and all other impurities.

Water.—To be clean and fresh.

Portland Cement.—To be of the best quality.

Waterproofing.—All concrete and rendering to be mixed with "Toxement" or other good waterproofing material, mixed to manufacturer's directions.

Concrete.—To be composed of four (4) parts of gravel or broken hardstone to pass through three-quarter (¾) inch mesh to two (2) parts of sand to one (1) part of Portland cement.

Mixing.—The concrete is to be mixed upon a platform and the aggregates accurately measured as above.

The sand, gravel, and cement to be spread in layers upon the platform and mixed three (3) times dry or until of a uniform colour and to be turned over three (3) times while the water is being applied, which is to be poured on slowly and with care, and the whole thoroughly incorporated. Concrete after mixing is to be used at once. Well ram as the work proceeds, and the whole to be left with a smooth level surface.

No concrete which has once taken its initial set shall be worked up or used again in the works.

All concrete to be protected and kept free from dirt.

Casing.—Provide casing for walls and top of one (1) inch boarding well strutted and laid with close joints and well wetted before depositing the concrete.

Reinforcement.—To be of expanded metal or other good fabric and locked together according to manufacturer's directions and securely bound together with number sixteen (16) gauge wire so as to form a continuous and rigid frame throughout. Top and bottom fabric reinforcement to be bent up or down and tied to that of sides.

The fabric reinforcement to be placed in walls two (2) inches from outer face of walls and one (1) inch from underside of top and bottom, as shown, and to be temporarily blocked out to keep in position while concrete is being filled in, all blocks being removed as the concrete is laid.

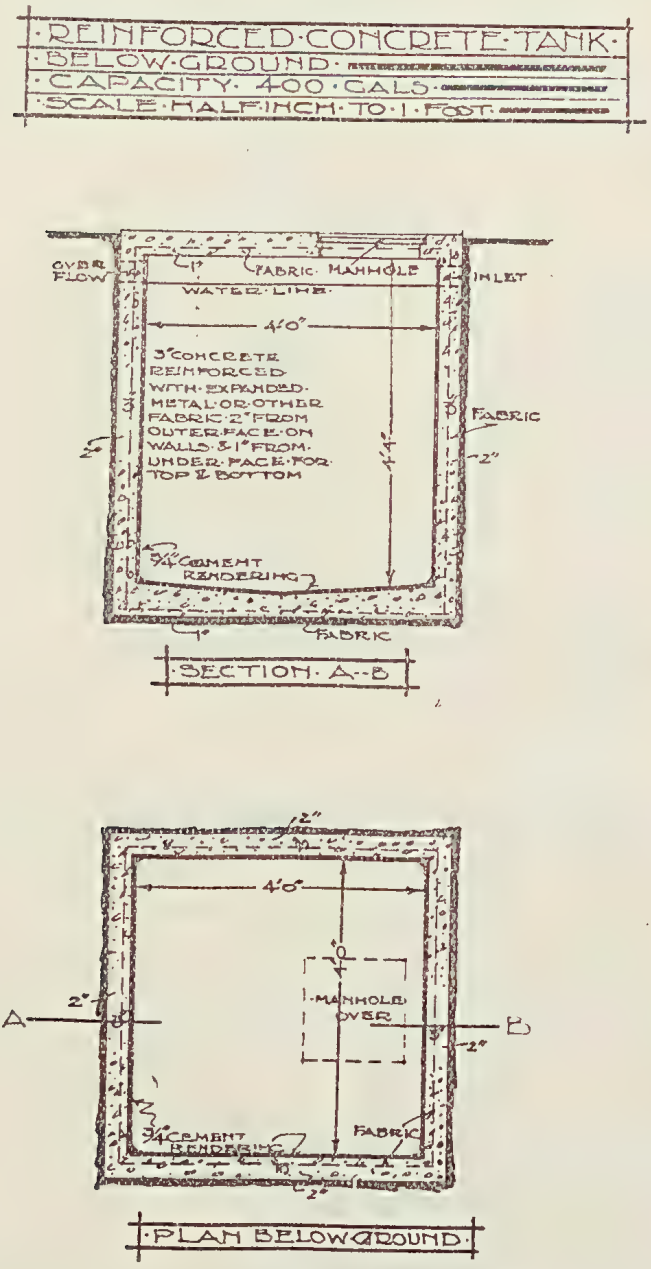
Concrete Work.—The sides and top to be three (3) inches thick and the bottom five (5) inches thick, with sinking to centre as shown.

The bottom to be laid first and well tamped. The junction of walls and bottom to be continuous and the sides to be filled in twelve (12) inches layers and spread and settled around and through reinforcement and carefully tamped as the work proceeds.

The top to be laid on centring with one (1) inch layer of concrete; the reinforcement fabric is then to be placed in position and tied, and the remaining two (2) inches of concrete to be carefully laid.

The work should be continuous, as the tank should be monolithic. Should it be necessary to stop work so that concrete sets, when recommencing work the existing bed of concrete shall be brushed perfectly clean, well watered, and grouted with equal parts of cement and sharp sand.

Rendering.—Render the whole of the sides and bottom as shown while the concrete is green with mortar composed of two (2) parts sand to one (1) part of Portland cement and three-quarter (¾) inch in thickness, finished to a good smooth surface with steel trowel, all angles to be rounded or filletted.



Manhole.—Form rebate in top for manhole and fill in with cast-iron manhole cover with lock and key.

Inlet, &c.—Set pipes for inlet and overflow as the work proceeds.

Keeping Damp.—Keep the concrete top damp, covering with wet bags, for at least fourteen (14) days after completion.

Removing Centring.—Remove centring fourteen (14) days after completion of the top.

Clean out.—Thoroughly clean out the inside of the tank at completion of work.

THE ALGAROBA BEAN (*PROSOPIS JULIFLORA*): IS IT LIKELY TO BECOME A PEST?

Mr. J. Locke, of Mackay, writes questioning the value of the Algaroba tree as a fodder plant, and suggests that, as such, it is much overrated. *Inter alia*, Mr. Locke says:—"In 1915 I procured some seeds of this so-called king of all fodder plants. The seeds germinated freely, and I transplanted half a dozen young trees, which have since flowered and borne crops of beans. The trees bristle with thorns, and it is almost impossible to pick the beans from the boughs in the centre of the bush. After the beans are gathered they must be dried and then ground in some machine. Upon consideration it will be apparent that the cost of labour involved by all these operations is more than the value of the product. As a fodder plant the Algaroba will not bear comparison with many cereals or legumes, and as a standby in time of drought its value when compared with ensilage is infinitesimal. As a pest, if it gets a grip of our rich scrub lands it may become as great a curse as lantana or prickly-pear. I write to sound a note of warning and advise intending planters to exercise caution when buying these much advertised novelties, which are often not worth the care bestowed upon them. Certainly the Algaroba has been tried and found wanting."

In this connection it is interesting to note that the Government Entomologist and Plant Pathologist (Mr. Henry Tryon) some time back addressed the following letter to the Under Secretary, Department of Agriculture and Stock:—

"This tree has been pronounced to be 'one of the most valuable sources of feed in Hawaii,' alluding to its place amongst leguminous forage plants. It is one of the mesquite trees and was formerly introduced from Mexico in order primarily, it is understood, to clothe the more arid portions of that region, and so induce rain, or obviate the too rapid loss of such as had already fallen. From my personal observations of the habits of the Algaroba, both in the Hawaiian Islands and in the part of North America from which it originally emanated or nigh thereto, I have come to the conclusion that it is likely to become a serious pest anywhere where its employment is not essential for the purposes alluded to—as appears to be the case in regard to Queensland. Its habit where growing spontaneously (and it most readily becomes naturalised) is to form a veritable thicket of an impenetrable character, to the exclusion of other vegetation or useful vegetation. How widely it may become disseminated will appear from the fact that it is the beans or pods of the tree, on falling to the ground and where accessible, that cattle almost exclusively consume. For on consuming them they do not digest the seed, but pass it out with their droppings, to be just in the condition favourable to its germination. (This, of course, does not apply to the use of the pods by dairymen and livery stable men, who pick up the small pods from under the trees for the purpose, first kiln-dry them and grind them, seeds and all.) However, 'when milch cows are fed on Algaroba milk consumers complain of a bad flavour in the milk' and 'in some cases bowel trouble in children has been attributed to the feeding of the Algaroba (to cattle) by dairymen' (C. K. McClelland)."

The matter being referred to the Government Botanist (Mr. C. T. White, F.L.S.), that officer replied as follows:—

"In importing foreign plants for either æsthetic or economic purposes, it is well to take into consideration experiences in other parts of the world with the particular species imported. It must be remembered that quite a number of our pests were imported for definite purposes—thus, the lantana, billy goat weed or bluetop, and water hyacinth were imported as garden plants, while the prickly-year and wait-a-while or hold-me-back (*Cæsalpinia sepiaria*) were introduced as hedge plants.

"In regard to the Algaroba, J. F. Rock, the leading authority on the plants of the Hawaiian Islands, states that 'No tree so far introduced has proved of such enormous benefit to these islands as the Algaroba . . . . all the waste lands which previous to the introduction of this tree were absolutely barren are now covered by green forests made up exclusively of this tree.' In the Hawaiian Islands its principal use has been to cover large previously treeless mountain areas and so prevent soil

erosion and the too rapid loss of rain that had fallen; its use as a fodder-tree plant, firewood, and tanbark are probably secondary values.

"In the southern United States, where the plant is a native, opinions are not so definite on its value. There its value is particularly confined to its use as a fodder, and in this connection J. S. Smith, in Bulletin No. 2 of the Division of Agrostology, U.S. Department of Agriculture, states:—'It is the most common tree of the mesas of the South-western United States, and because of its many uses is an exceedingly valuable species. Experiments in a small way have been made to preserve the beans for winter feeding, with partial success only, because of a small weevil that bores into them after they are gathered and renders them unfit for stock feed. One acre of land well covered with mesquite trees often produces not less than a hundred bushels of the beans per annum. The mesquite bean is looked upon by some as a curse and by others as a blessing. The trees are spreading with great rapidity since prairie fires are no longer set to keep this and other weedy plants in bounds. Within the last twenty years the mesquite bean and the prickly-pear have covered many square miles of land in Texas which was formerly open prairie. There is no doubt that the amount of grazing has been diminished by the spread of mesquite brush. On the other hand, the beans are of decided value in times of drought, when grass is scarce. It is probable that the mesquite bean is now of less value than formerly, before it was known that alfalfa could be successfully grown for winter feed or the hay used in times of drought.'

"Writing in the same series (Bulletin No. 10) on the grasses and forage plants of Central Texas, H. L. Bentley states:—'As, bushel for bushel, they are quite as valuable for feeding stock as cow peas, it will be seen that for forage purposes the mesquite tree is an important factor in this section, where there are millions of them.'

"From the foregoing it would seem the greatest danger from this tree would be from its spreading over areas carrying valuable native grasses, as in the Central, Northern, and Gulf districts, where it might crowd out the native grasses and herbage and so lessen the carrying capacity of the land, in somewhat the same way as the *Parkinsonia* tree has done in various parts of Western Queensland. The dry scrubs in the Central district, as those in the neighbourhood of Rockhampton, are also places where the tree might possibly get a hold in somewhat the same way as the lantana already has in many places.

"It is comforting to know, however, that the tree has been in Queensland for a number of years without showing signs of becoming a pest in any way, for seeds were first introduced in 1877 and the tree was bearing pods at Kamerunga State Nursery over twenty years ago. On the whole, the advantages derived from the tree would appear to outweigh the disadvantages, but it would be as well to keep a sharp lookout to see that the tree is not spreading too rapidly, to the detriment of better vegetation.

"In planting trees for fodder for use in times of drought we have, in my opinion, in many native sorts species better than the imported, as, for instance, the kurrajong (*Brachychiton populneum*), red ash (*Alphitonia excelsa*), Mulga (*Acacia aneura*), cattle bush (*Pittosporum phillyræoides*), supple jack (*Ventilago viminalis*) and others. The value of these trees should not be overlooked in any scheme of planting trees as emergency feed in times of drought."

CUTWORMS.

By N. A. R. POLLOCK, Northern Instructor in Agriculture.

In experimenting in disease control with tomato plants at Bowen, part of the treatment was to dip the roots and stems of the plant, after lifting from the seed bed in a solution of 1 part sulphate copper (bluestone) to 500 parts water (a heaped teaspoonful of the powdered bluestone to 3 pints of water is near enough). It was noticed that while plants set out without this treatment were often lost by being eaten off at the ground by cutworms or other insects, no instance was noticed of attack being made on a treated plant. Possibly this experience may be of value to growers who suffer loss when setting out other plants..

It is important to keep the leaves free from the solution.

REINFORCED CONCRETE TANKS.

For the article appearing on pages 267-270, the specifications and plans were prepared and courteously supplied by officers of the Department of Public Works, Brisbane, in response to a subscriber's request referred to them.

COTTON.

By H. C. QUODLING, Director of Agriculture.

Cotton is not by any means a new crop to Queensland. Its cultivation commenced here in 1860, and ten years later the area cropped had increased from fourteen to upwards of fourteen thousand acres. The origin of cultivation and this increase was brought about by two contributory causes—a bonus on cotton, and an extraordinary demand due to the American Civil War. The re-appearance of American cotton in the European market on the conclusion of the Civil War, and the difficulty in those days of communication with Europe were the principal factors in a decline in the area cultivated, and which continued until 1887.

The industry was resuscitated soon after and manufacturing undertaken on two separate occasions at Ipswich, but operations in this direction were not at any time very extensive. Cessation on the last occasion was due to competition from abroad, there being no protective duty.

Low prices over a term of years acted as a check to development. Added interest was shown in the crop in 1903, and in 1913 the Government made an advance of 1½d. per lb. on seed cotton and ginned it on owner's account, the final return being equal to about 1¾d. per lb. The system of making advances to farmers has since been continued. Last year, and again this year, the advance was 5½d. per lb., and the same rate will be maintained until 30th June, 1923.

The present Government has throughout shown great interest in the cultivation of cotton, and the advance of 5½d. per lb. is due to their desire to encourage the farmers to cultivate this crop with the sure knowledge of a market, thus establishing the industry.

Extraordinary interest is now shown in the crop, which has proved most remunerative; in fact, many farmers now engaged in cotton-growing had not hitherto been so prosperous.

The active participation by the Australian Cotton Growing Association (Queensland), which has established modern ginning plants at Rockhampton and Brisbane (Whinstanes), has also contributed to the flourishing condition of the industry. An assured price of this character, even should it be regulated at a later date, according to a sliding scale consistent with varying qualities of cotton, is calculated to do much towards the extension of what promises to be a very important industry to Queensland. The 1921-22 crop promises to exceed a total of 1,500 tons of cotton in seed, and a big increase is expected for 1922-23.

Efforts are being directed by the Department towards the introduction into cultivation of improved long staple Upland varieties, with a view to the production of cotton which will return a good aggregate yield, and command also the highest possible price obtainable.

A sub-tropical climate, copious rains in the spring and early summer, followed by a dry autumn, are favourable conditions for the development of the cotton plant.

Upland cotton should be grown as an annual crop and in rotation, wherever possible, with other suitable crops.

DIRECTIONS FOR PLANTING UPLAND COTTON.

Cosmopolitan Character of Plant.—Under favourable climatic conditions cotton will thrive on a great variety of soils. A naturally well drained soil should be chosen.

Drought Resistant Habit.—The plant is a deep rooter and naturally drought resistant once it is firmly established, but responds to good cultivation, and will return heavier crops on cultivated land where the surface soil has been thoroughly prepared some months beforehand, and moisture stored up in the sub-soil and conserved by regular cultivation for the use of the growing crop.

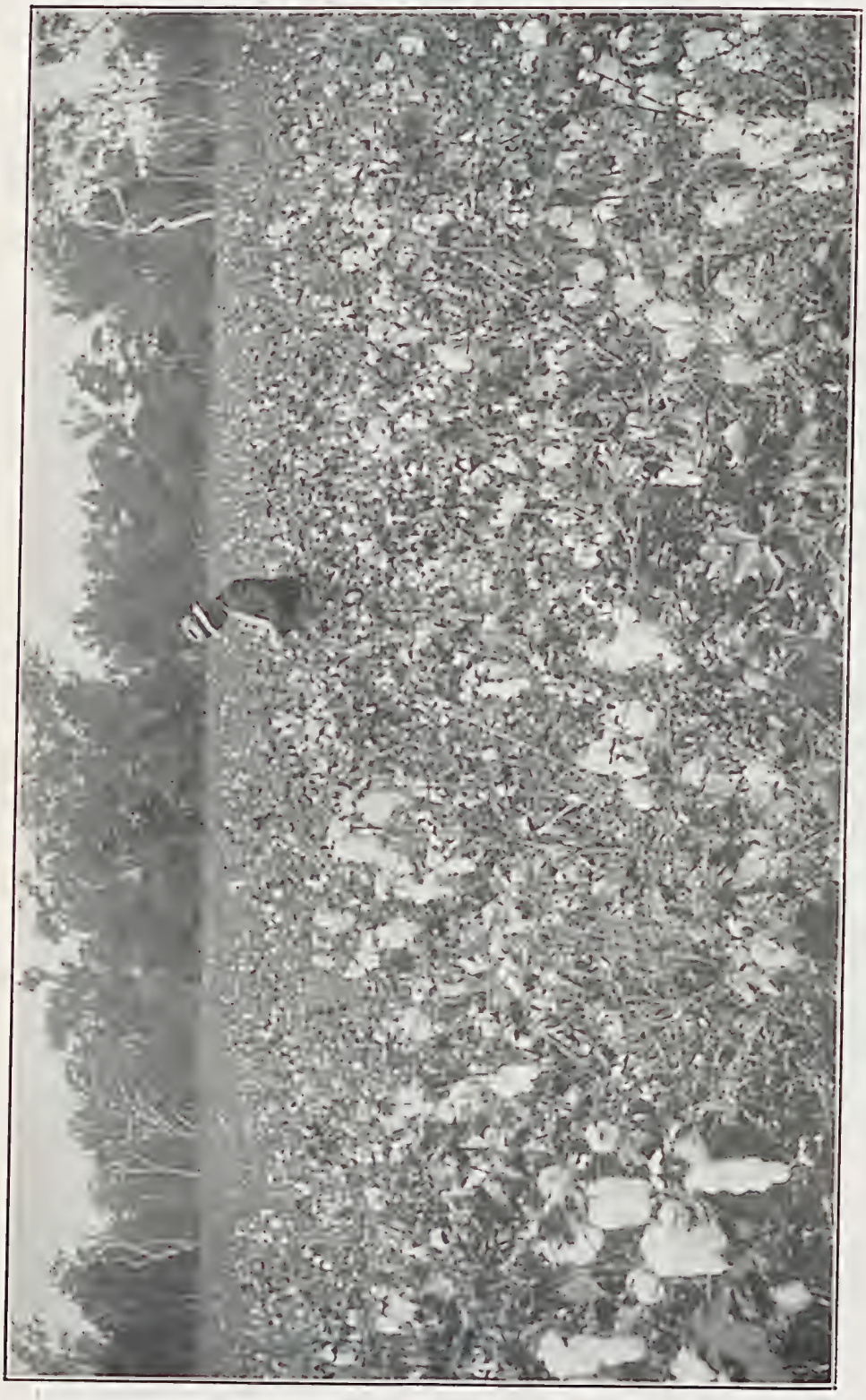


PLATE 56.—CROP ON MESSRS. IRELAND'S PLANTATION, ALMA CREEK, DAWSON VALLEY.

PLATE 57.—COTTON CROP ON MR. J. L. W. JENSEN'S FARM, WOWAN, DAWSON VALLEY—FIVE ACRES PRODUCED TWO TONS AT THE FIRST PICKING.

Well Prepared Land Essential.—Land that is ploughed and cross-ploughed, not necessarily deep, say to a depth of six or seven inches, should be worked up to a good tilth on the surface prior to the seed being sown. In this way germination is assisted, and a supply of plant food made readily available.

A Good Crop for Scrub Land.—Cotton is a suitable crop for and thrives well on recently burnt off scrub land, amongst the stumps and unburnt logs, the seed either being planted by hand in a shallow depression, not more than an inch and a-half deep, made and covered in again with a hoe, or else put in with an ordinary maize "hand planter."

Where practicable, parallel dray tracks should be cleared at intervals, say every two chains, throughout the field, to facilitate the removal of the picked cotton at harvest time, the stumps along the tracks being cut off close to the surface of the ground to facilitate the passage of dray or other conveyance used.

Judgment should be used when planting seed to keep it in fairly straight lines or rows, which may vary in width, say between 4 and 5 ft. apart, according to the conditions under which the cotton is grown. The seed is customarily sown in closely-spaced hills 15 to 20 in. apart along these rows, two or three seeds to a hill, thinning to a single, strong, vigorous plant when the plants attain a height of about 6 to 8 in.

Where the surface is rough, or encumbered with logs or stones, wider and more irregular spacing of hills is necessary; allowance being made in this instance for plant development and room to move amongst the plants at harvest time.

On the other hand, where there has been a clean burn, close and continuous planting is permissible, in order to approximate the final distances apart of plants aimed at, when cotton is grown on cultivated land.

The Cotton Crop as an Adjunct to Dairying on Scrub Land.—Where recently burnt off scrub lands are required soon afterwards for dairying purposes, cotton may be grown, under favourable conditions, as a primary crop, and Rhodes grass seed sown, say at the rate of 4 to 5 lb. per acre, throughout the growing crop, when the young cotton plants are established. Planting of the grass seed should be regulated to fit in with the wet season, and to allow time for the grass to establish itself before the winter. If sown too early, the grass would smother up the cotton plants, and tend to reduce the yield of cotton.

Amount of Seed per acre and Distances between Rows on Cultivated Land.—About 10 lb. of seed are sufficient for an acre, when care is exercised in planting. Rapid and economical planting is assured by the use of a two-row maize or cotton planter.

Rows 4 feet Apart.—This is a fair average distance between the rows, but this width should be increased under special circumstances, as described. Where a single-horse maize drill is used for planting the seed, very light furrows may be run out 4 ft. apart with the plough and the seed drilled in the furrows; or *preferably* a marker may be used, marking three rows at a time, as a guide when sowing for the person who uses the drill. Prompt harrowing immediately after either of these operations is necessary.

Rows 4 feet 6 inches Apart.—On good agricultural land, where vigorous growth is expected, the rows may be 4 ft. 6 in. apart, and the plants left to stand 12 to 15 in. apart in the rows.

Rows 5 feet Apart.—When arranging for planting on rich land, where forcing conditions may be expected during growth, an allowance must be made for the extra size attained by the plants. Here the rows may be 5 ft. apart, but the plants should be crowded in the rows and left at from 12 to 15 in. apart at the final thinning.

After Cultivation.—Early and constant use of the horse hoe (the later the cultivation the shallower it should be) is necessary to keep the weeds down, and the soil in a well aerated condition. In this way the plants can be carried over any dry spells.

On Scrub Land.—The use of the hand hoe on scrub areas will also be conductive to heavier yields and healthier crops.

Distances between Plants in the Row.—Judgment is to be used in all plant spacing. A good average planting space between the single seeds and the young plants grown therefrom is from 8 to 10 in. It is necessary, however, to thin these out when they are several inches high.

In dry districts, one strong plant should be left at intervals of from 15 to 20 in. Emphasis is placed on the fact that on rich soil, when the season is good, plants require to be kept close together in the rows, say 12 to 15 in. apart.

In Upland cotton, if the spaces between the plants in the rows are at all wide it induces the formation of "vegetative" (woody) branches to the detriment of the "flowering" (bud and boll bearing) branches, and a consequent reduction in cropping capacity.

PLATE 58.—COTTON CROP (20 ACRES) ON MR. L. SMITH'S FARM, DULULU, DAWSON VALLEY LINE.

Yield.—1,200 lb. per acre to date (picking not complete).

PLATE 59.—DRYING THE COTTON, BEFORE BALING, ON MR. L. SMITH'S FARM, DULULU, DAWSON VALLEY LINE.

PLATE 60.—DRYING THE MORNING PICKING ON MR. C. G. YOUNG'S FARM, DEEFORD, DAWSON VALLEY.

PLATE 61.—BALING COTTON AT MR. C. G. YOUNG'S FARM, DEEFORD, DAWSON VALLEY LINE.
(Note improvised dumping appliance).

PLATE 62.—COTTON FIELD ON MR. C. H. CHOWN'S FARM, WOWAN, DAWSON VALLEY. Miss Chown made the record picking of 170 lb. seed cotton in one day.

PLATE 63.—REFRESHMENTS IN "DIXIE" LAND—MR. H. WENCKE'S FARM, MYRTLEVALE, WOWAN, DAWSON VALLEY LINE.

Treatment of Seed.—Owing to the short fluffy fibres adhering to the seed, it must be treated prior to attempting to pass it through a drill or maize hand planter. Puddled clay or flour paste is commonly used for this purpose. Seed is dipped, in small quantities, into a vessel containing either of the above mixtures, the best consistency for which is readily ascertainable by a little practice. That treated with puddled clay should be rolled by hand on a sieve or other suitable surface, and the seeds made up to resemble small marbles, which must be allowed to dry out in the sun; when drying out, careful handling is necessary.

The flour paste treated seed is dipped into the prepared paste, drained, and well squeezed, but care should be taken at once to prevent the seeds sticking together. Ashes are useful in this latter respect, but the seeds should be carefully separated and dried out on bags or on a tarpaulin to ensure their regular and easy passage through the seed drill.

The fluff on the seed may also be singed. For this purpose a dry hollow log 3 to 4 ft. in length is stood up on iron bars over a tub of water. The inside of the log is fired, and the seed dropped through in a thin stream from the top directly into the tub of water, and dried out immediately after, so as to be ready for use.

Time to Plant and Period of Maturity.—Other things being favourable, the time for planting seed varies according to climatic conditions ruling in any particular district, and planting may be carried out as soon as danger from frost is over, up to October, and in some localities to mid-December. Under satisfactory growing conditions the first flower buds appear when the plant is about forty days old. It takes about another thirty days for the flower to expand. The flower remains open for about three or four days and drops off, changing to a richer colour before doing so. The boll increases in size for about fifty or sixty days, and then bursts open, through the growth of the cotton lint enveloping the seed. Development and expansion of the fibres follow on in natural sequence until the full, fluffy boll of lint completes the process of development of the cotton.

It is inadvisable for a crop to mature during the summer rainy season. The dry, fine, hot weather customarily following on immediately after this period is the best kind of weather for the plant to complete the bearing and maturity of its crop of cotton. Obviously, soils which are of a loamy or of a sandy loam character, and are of good capillarity, will not suffer so much from dry weather as those which are liable to crack or fissure. It is at this late period in the life of the growing plant that reserve supplies of soil and subsoil moisture are drawn upon in order to fully develop its crop.

On good, rich agricultural land, in moist, warm weather, the cotton plant has an inclination to make rather too much growth.

Ordinarily, the crop takes from four to four and a-half months to mature. As the whole of the bolls do not ripen at once, it is necessary to allow the main crop to fully ripen and develop and the bolls to open well before attempting to pick. A second and possibly a third picking may be necessary to ensure the harvesting of the full crop.

Harvesting.—Picking should not commence until the dew has completely dried off the cotton. Cotton picked in the morning should be exposed to full sunlight for some hours before baling, to thoroughly dry it out.

The strictest care should be exercised to keep the seed cotton free from leaves, sticks, dirt, or foreign matter of any description, and stained or discoloured cotton, unripe and dead locks, should not be mixed with the clean, sound, marketable sample.

Clean bales should preferably be used for the reception of the crop. These require to be legibly branded before despatch to their destination—the Australian Cotton Growing Association's Ginnery, either at Whinstanes, near Brisbane, or Rockhampton, whichever is the nearer.

AMERICAN TYPE OF COTTON PICKING BAG.

The cotton picking bag illustrated is in general use in American cotton fields, and it is recommended by the Australian Cotton Growing Association. The bag is 6 feet deep with one side extended to form an apron to rest against the user's body and to provide a rubbing surface when pushing the cotton down into the mouth of the bag.

PLATE 64.—A COTTON-PICKING BAG.

UPPER BROOKFIELD.

By J. MITCHELL, Instructor in Fruit Culture.

How few Brisbane people there are who know of the existence almost at their doors of Upper Brookfield; its wealth of natural beauty and its material wealth hidden, and, seemingly, as yet unbidden, in its practically untilled soil. Within a few miles of the Brisbane G.P.O. is a stretch of country that is a delight to the eye of the Nature lover, a happy hunting-ground of the naturalist, a glory of virgin woodland, a land of golden promise slowly emerging from the primitive to the practical. Fertile valleys checked in green and brown with growing crops and furrowed fields, silver-threaded with crystal streams, and sheltered by ranges ribbed with densely forested buttresses—all this is Upper Brookfield. It would seem that Nature herself planned this beautiful locality for one great garden, and, though within the traffic roar of a great metropolis, to-day only the staccato tap of a settler's axe or the call of a bird to its mate awakens echoes down along its scrub shaded silences.

Soil Fertility.—The land in the Upper Brookfield area is very fertile, and with proper cultivation it would grow many varieties of fruit. The country already cleared for dairying is rather too open for successful banana culture, but large areas of standing scrub sheltered by the range and of suitable soil and aspect should provide successful plantations.

Cultivation and Settlement.—Among the newer settlers are several returned soldiers, who have already made great headway on their holdings. Among these are Messrs. F. Midgely, Jos. Soper, and A. D. Gillies. Right at the head of a creek in a crescent-shaped pocket is the plantation; admirably situated and sheltered is the plantation of the last-named, and one of the snuggest and best-worked little properties in the district. Mr. Gillies is a believer in intense cultivation, and he keeps his banana plants on the single-corm system. In no case are more than two followers allowed at the right time—that is, when the parent plant is allowed to throw its bunch. The area has been planted 12 ft. by 12 ft. Where the land is so fertile, with a sufficiency of humus, it might be advantageous to plant one sucker between each two plants in one row, thus making the plantation 12 ft. between the rows and 6 ft. in the row. The 6-ft. rows should be across the hillside, where washaways are likely to occur. All decaying stalks and leaves might be supplied as manure to this row. In selecting suckers as followers, it would be wise to leave the young plant on the upper or hillside. To keep the plants their proper depth in the soil, when suckering or pruning, the bulb should be disconnected from the parent plant. Planters in this locality would be well advised to cut out the maiden plants in the course of July or August that are likely to produce what are called November bunches. This practice will foster good suckers giving a bunch ready for the winter cut.

Accessibility.—With a personal equation among its settlers of high value, backed by fertility and climate, Upper Brookfield is bound to come into its own, but its immediate progress is retarded by its primitive roads. The settlers declare that all they require is a main road to be constructed by the Main Roads Board. The settlement would thus be brought within an hour of metropolitan markets by motor lorry. With such a fertile and productive area at the door of the city, apart from the tourist value of such a road, it should not be long before their very reasonable hope is realised.

AUSTRALIAN MEAT FOR BRITISH ARMY AND NAVY.

In England recently Mr. Jowett, M.P., expressed surprise that the Imperial Government contracts for the supply of navy and army with Argentine frozen beef were still in existence. He point out also that an arrangement existed for certain Argentine meatworks to be run on the Board of Trade account, thus shutting out Australian beef from army and navy contracts. Mr. Jowett directed attention to this injustice to Australian producers, and was informed that the British army contracts now running will cease after 30th June. After that date the army will be prepared to take Australian meat. In this connection Queensland houses have been asked by the importers of Queensland beef in London to reduce freezing charges by one-eighth of a penny a pound, this reduction to be made unconditionally, and to facilitate the reduction of freight charges and other Australian costs.

PLATE 65.—BANANAS GROWN BY A SOLDIER SELECTOR, BROOKFIELD, NEAR BRISBANE.

PLATE 66.—A SOLDIER SELECTOR'S HOMESTEAD ON BANANA PLANTATION, BROOKFIELD.

PLATE 67.—BANANA-GROWING ON MR GILLIES' SELECTION, BROOKFIELD.

PLATE 68.—BANANA PLANTATION ON MR. GILLIES' SELECTION, BROOKFIELD.

PLATE 69.—BANANAS ON A SOLDIER'S SELECTION, BROOKFIELD.

PLATE 70.—YOUNG PLANTATION ON A SOLDIER'S SELECTION, BROOKFIELD.

TREATMENT FOR STOMACH WORMS IN SHEEP.

Mr. J. Legg, B.V.Sc., M.R.C.V.S., Government Veterinary Surgeon, Townsville, writes:—

"I am in receipt of a report concerning treatment of stomach worm in sheep, which was kindly forwarded to me from South Africa by the Director of Veterinary Research, and, among other things, it contains some valuable information concerning the treatment of stomach worms in the sheep.

"Comparisons were made between various drugs and combinations of drugs, regarding their efficacy in removing the stomach worm from sheep or heavily infested animals, and it was found that a combination of copper sulphate and sodium arsenite was not only superior to any other drug, but was superior to any other of the arsenic compounds.

"This combination was found in most instances to remove 100 per cent. of stomach worms, even in those cases where gross infestation had been invoked by artificial means.

"The drugs are used in the powder form, and each dose is placed on the back of the tongue by means of an ordinary teaspoon. The operator simply opens the mouth of the sheep and places the dose on the back of the tongue with the spoon. A large number of doses can, of course, be made up in bulk, and a series of small spoons are used in administration, each spoon when full to the rim holding the required dose. One man carries the mixture in a bowl, and with the spoon picks up the required dose and places it in the teaspoon held by the operator who doses the sheep. In this way it is found that a large number of sheep are quickly dosed.

"Doses are as follows:—

Age of Lamb.	Sodium Arsenite.	Bluestone.
2 to 4 months	½ gr. = 36 m g = ·555552 gr.	2¼ gr. = 144 m.g. = 2·222208 gr.
4 to 6 months	¾ gr. = 50 m.g. = ·7716 gr.	3 gr. = 200 m.g. = 3·0864 gr.
6 to 10 months	1⅛ gr. = 75 m.g. = 1·1574 gr.	4¾ gr. = 300 m.g. = 4·6296 gr.
2 tooth ..	1½ gr. = 100 m.g. = 1·05432 gr.	6 gr. = 400 m.g. = 6·1728 gr.
4 tooth ..	2 gr. = 125 m.g. = 1·929 gr.	7¾ gr. = 500 m.g. = 7·716 gr.

M.g. means milligrams."

AN EXTENSIVE FARMER.

Accompanying the Empire Exhibition delegation is Mr. F. Hiam, a member of the National Institute of Agricultural Botany (U.K.), and probably the most extensive farmer in England. He has about 7,000 acres under cultivation in Norfolk and Suffolk, with his headquarters at Cambridge, from which there is a system of telephonic communication with the various portions of his estates. His remarks in the course of a Press interview will interest Queensland farmers, throwing as they do a sharp light on methods of farm management in the United Kingdom, the efficiency of which so impressed members of the A.I.F. who took advantage of the opportunities provided for them under the A.I.F. educational scheme to study at first hand farming practice in the old country. Speaking of his work Mr. Hiam said:—

"An early start is necessary, as sometimes orders arrive, say, for the immediate delivery of 100 tons of potatoes. My farms are in two blocks, which are 10 miles apart, and these are served by a light line of railway. Each block comprises a group of farms containing 300 acres, and each farm is in charge of a bailiff, and there is again a chief bailiff in control of every 3,000 acres, and a head bailiff supervises the whole staff. I go in extensively for the cultivation of potatoes. My annual crop is generally about 2,300 tons, and I sometimes plant the same land for two or three years in succession with tubers, and then sow the land with wheat. There is no need to plough the ground for the wheat crop, and the seed is merely harrowed in. The potato land is ploughed from 10 in. to 1 ft. deep, three horses being used for every single-furrow plough. I tried tractors, and scrapped them, as I consider horses a much cheaper proposition. Altogether I have used ten different kinds of tractors, which cost on an average £750 apiece, and after working for four years I could not get £50 each for them. I fallow the wheat crop again to a great extent with potatoes, and the seed comes from Scotland, where I produce 2,000 tons of seed potatoes annually. These potatoes are produced profitably at 30s. a ton, and are the best in the world for seed purposes, a very large quantity being exported every year to America.

A SUMMARY OF EXPERIMENTS CARRIED OUT BY THE BUREAU OF SUGAR EXPERIMENT STATIONS, FROM 1902.—II.

BY H. T. EASTERBY, General Superintendent.

The first article of this series, in the course of which Mr. Easterby discussed deep cultivation experiments and tabulated comparative crop results from subsoiled and non-subsoiled fields, was published in the May Journal. The second instalment is an account of the results of irrigation experiments and the action of irrigation and manures upon the density and purity of sugar juices.—ED.

EXPERIMENTS WITH IRRIGATION.

The principal experiments with irrigation for cane crops were carried out at the Mackay Sugar Experiment Station from 1905 to 1909. The question was approached from two sides. On the one hand tests were made in order to show what deep, thorough, and subsoil cultivation will do in the matter of aiding the crop or crops to resist the action of drought, and in avoiding the cost of resort to irrigation. On the other hand irrigation was practised to demonstrate its actual net value over a reliance upon rainfall. The results of the irrigation and cultivation experiments go to show that while irrigation will be found to have a high economic value where the water can be obtained and applied at low cost, yet deep, subsoil cultivation, advisable in all conditions with or without irrigation, will enable crops to be grown economically in locations where irrigation is not practicable and where the annual rainfall is fairly good. In the application of water to the cane crop there are two chief modes of distribution. The one, which may be called the Hawaiian method, consists in applying the water to the cane in deep furrows, the furrows being intersected or cut up into short lengths of 20, 30, or 40 ft. By the other method the water is applied in channels between the cane rows, and runs whatever distance is determined upon, which is often from one end of the field to the other. By the latter method there is no such thing possible as an even distribution over all the land, and it is possible to cause great damage to areas where the water can accumulate and stagnate, or where it leaches too freely through into the subsoil, carrying soluble soil elements with it. The application of water to the cane in deep, short furrows is the method securing the maximum value of the water at the highest cost of labour. Irrigation in channels between the rows of cane involves the greatest expenditure and waste of water, with a minimum cost of labour in application, and at the greatest risk of damage to the soil. Both these methods of applying water are largely controlled by the nature of the soil and its subsoil.

The water used for irrigation at the Mackay Station was obtained from an underground running supply, which is believed to underlie large areas of the Mackay delta. By putting down a bore to a depth of 64 ft. below the surface of the station field, and to 20 ft. below the sea level, an abundant supply of sweet water was found. Water was found at 18 ft., at 40 ft., and at 64 ft., whence it was finally obtained, the pressure raising the supply 36 ft. up the pipe. There are, doubtless, other water-bearing strata at lower depths. The water was pumped up into raised tanks. Every gallon of water used in the experimental irrigation tests was measured and applied direct from the tanks.

The irrigation experiments mentioned above were carried out under the following four sets of conditions:—

1. Irrigation, mixed manures; all other conditions of cultivation being equal.
2. Irrigation, no manures; all other conditions of cultivation being equal.
3. No irrigation, mixed manures; all other conditions of cultivation being equal.
4. No irrigation, no manures; all other conditions of cultivation being equal.

These experiments were planted in April, 1905, upon uniform land, and in a soil of uniform depth and composition.

The cultivation was the same upon all the plots within the series, and comprised the following acts:—The ground was ploughed to an actual depth of 12 in.; after the plough the subsoiler went to a further depth of 8 in., thus furnishing a depth of loose soil of not less than 20 in. Three cross-ploughings followed at intervals of not more than four weeks. The final result of all the preparatory cultivation was that the soil was in the condition of a fine loose tilth to the depth already stated.

The cane on all these comparative test plots was planted as follows:—Sets with three eyes were planted 6 in. apart in the row, and covered with a depth of 3 in. of soil. The rows in all these experiments were exactly measured and were 5 ft. apart.

The planting was immediately followed by heavy rains lasting over a month, and then by very cold dry weather, which checked the germination and growth of the cane.

The remaining six months of 1905 were the driest recorded for some years, only 7 in. of rain falling in the whole of that time. This dry spell enabled the irrigated plots to take and maintain the lead, and the tables of results, in a later place, will indicate that the initial effect of these climatic conditions have had a controlling influence on the final crop results, particularly in the case of the non-irrigated plots.

RESULTS OF THE PLANT CROP, 1906.

The action of irrigated water and manures upon the chemical composition of the juice is shown in the following table:—

Conditions.	Average Density of Juice (Brix.)	Average Sucrose in Juice.	Average Quotient of Purity.
Irrigated plots: Mixed manures ..	19·15	17·409	90·90
Irrigated plots: No manures	19·43	17·837	91·80
Non-irrigated plots: Mixed manures ..	18·86	17·295	91·70
Non-irrigated p'ots: No manures ..	19·49	18·219	93·47

With reference to this table it is indicated—First, that irrigation, which means a maximum or some excess of moisture, has tended to lower the purity of the juice; second, it is also indicated, both upon the irrigated and non-irrigated plots, that the manures while increasing the production of cane tend to a slight depreciation in the purity of the juice. This result is in agreement with the results at other experiment stations. These results, however, are not without exceptions, for, upon land which has become thoroughly exhausted by long and continuous cropping, the application of a mixed manure very frequently results in an improvement of the quality of the juice as well as in the yield of cane per acre.

A summary table is now furnished which presents the results from the plant crop obtained under the four sets of conditions, already explained, in a ready form for general oversight. These summary results show that, upon the irrigated plots, the manures resulted in an additional yield of 4½ tons of cane, and of half a ton of sugar, to the acre. Upon the non-irrigated plots, while the manures gave an additional yield of 3⅓ tons of cane to the acre, the increase in the sugar per acre was very small.

SUMMARY TABLE.

Conditions.	Weight of cane per Acre in English tons.	Yield of Sugar pe Acre in English tons.
Irrigated p'ots: Mixed manures, other conditions of cultivation being equal	58·4	9·1
Irrigated plots: No manures, other conditions of cultivation being equal	54·1	8·6
Non-irrigated plots: Mixed manures, other conditions of cultivation being equal	50·7	7·7
Non-irrigated p'ots: No manures, other conditions of cultivation being equal	47·4	7·6

In considering the action of the manures it has to be repeated that all of the plots now under consideration not only were subjected to deep ploughing, subsoiling, and a very thorough preparation by repeated cross-ploughings, but the whole of the land received the application of something over 2 tons of burnt lime per acre. This deep and thorough cultivation, with the lime, would cause a large proportion of the chemical plant food elements to be brought into a soluble and available condition for the use of the crop. These effects would therefore proportionately tend to lessen the special action of the manures, and to reduce the difference in the results between the manured and unmanured plots. As a matter of fact, large results were not expected in the plant crop from the manures; but it was expected that the same manures would give a larger account of themselves upon the several succeeding ratoon crops.

RESULTS FROM FIRST RATOON CROP OF ABOVE EXPERIMENTS, 1907.

The action of irrigation and manures upon the density and purity of the sugar juices is set out in the table following, where it is seen that the indications pointed out in the plant crop have been again repeated—namely, that irrigation and manures have a tendency, while increasing the yield, to lower the purity of the juices.

THE ACTION OF IRRIGATION AND MANURES UPON THE DENSITY AND PURITY OF SUGAR JUICES.

Conditions.	Average Density of Juice (Brix.)	Average Sucrose in Juice.	Average Quotient of Purity.
Irrigated plots: Mixed manures ..	20·0	18·18	90·9
Irrigated plots: No manures	20·5	19·06	92·9
Non-irrigated plots: Mixed manures ..	19·5	17·63	90·4
Non-irrigated plots: No manures ..	20·6	19·53	94·8

The summary table following presents the average results obtained from the plots under the four sets of conditions. It is shown that the irrigated plots with manures gave a slightly lower result than the corresponding non-irrigated plots with manures; while the irrigated plots with no manures gave a slightly higher result than the corresponding non-irrigated plots with no manures. The irrigated plots with manures show an increase of 9.3 tons of cane per acre and 1.3 tons of sugar over the irrigated plots with no manures; and the non-irrigated plots with manures show an increase of 10.7 tons of cane and 1.2 tons of sugar per acre over the non-irrigated plots with no manures.

SUMMARY TABLE.

Average of Results from the First Ratoons under the Four Sets of Conditions set forth.

Conditions.	Weight of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.
Irrigated plots: Mixed manures, other conditions of cultivation being equal	41·9	6·8
Irrigated plots: No manures, other conditions of cultivation being equal	32·6	5·4
Non-irrigated plots: Mixed manures, other conditions of cultivation being equal	42·4	6·7
Non-irrigated plots: No manures, other conditions of cultivation being equal	31·7	5·4

In comparing the results from the first ratoon crop with those obtained from the plant crop last year, it must be remembered we are now dealing with a ten and a-half months' crop, the plant crop being seventeen months old at time of harvest.

RESULTS FROM SECOND RATOON CROP, 1908.

SUMMARY TABLE.

Average of Results from the Second Ratoons under the Four Sets of Conditions.

Conditions.	Weight of Cane per Acre in English tons.	Yield of sugar pe Acre in English tons.
Irrigated plots: Mixed manures, other conditions of cultivation being equal	39·5	6·3
Irrigated plots: No manures, other conditions of cultivation being equal	24·0	3·9
Non-irrigated plots: Mixed manures, other conditions of cultivation being equal	38·8	6·1
Non-irrigated plots: No manures, other conditions of cultivation being equal	24·1	4·0

PLATE 71.—INTERIOR OF LABORATORY, SUGAR EXPERIMENT STATION, MACKAY.

The irrigated plots with manures in the second ratoon crop have given a slightly higher yield over the non-irrigated plots with manures, the difference being equivalent to 14 cwt. more cane per acre. On the other hand, the irrigated plots without manures give a very slightly lower result when compared with the non-irrigated plots without manures, the difference in favour of the latter being 2 cwt. more cane per acre. The irrigated plots with manures show an increase of 15½ tons of cane per acre and 2.4 tons of sugar per acre over the irrigated plots with no manures, while the non-irrigated plots with manures, show an increase of 14.7 tons of cane per acre and 2.1 tons of sugar per acre over the non-irrigated plots without manures.

RESULTS FROM THIRD RATOON CROP, 1909.

SUMMARY TABLE.

Average of Results from the Third Ratoons under the Four Sets of Conditions.

Conditions.	Weight of cane per Acre in English tons.	Yield of Sugar per Acre in English tons.
Irrigated plots: Mixed manures, other conditions of cultivation being equal	35·13	5·86
Irrigated plots: No manures, other conditions of cultivation being equal	19·63	3·32
Non-irrigated plots: Mixed manures, other conditions of cultivation being equal	35·95	5·91
Non-irrigated plots: No manures, other conditions of cultivation being equal	19·86	3·26

In these and other experiments with irrigation it was conclusively proved that in normal years at Mackay, with a fair rainfall, good deep cultivation will give as good results as are to be obtained with irrigation. Of course, it need not be said that in dry years irrigation greatly increases the crop, but as many Northern sugar districts only get one or two dry years out of ten it is very questionable whether the installation of an irrigation plant would pay outside of the Lower Burdekin and some of the Southern districts. The finest results from irrigation are always obtained in places where the average rainfall is low.

The methods of cultivation of the ratoons upon the non-irrigated plots were as under:—

> The middles were split open with the swing plough, followed by the subsoiler to a depth of 18 in. Those furrows next the cane were then ploughed away from the rows and similarly subsoiled, thus ensuring all ground between the rows being thoroughly moved and subsoiled. The mixed fertilisers were then applied to those plots which were to be fertilised, in the furrow next to the cane, which were then closed by the plough, this act also taking place with the plough on the non-manured plots, so as to secure uniformity of cultivation. The Planet Junior cultivator, fitted with broad hoes, was then run over all the ground between the stoles to level same down, and this implement was used for subsequent shallow cultivations while the cane was young.

On the irrigated plots no cultivation with implements took place, but the stole bed was loosened with picks, and the land subsequently kept clean with hand-hoeing while cane was young. Mixed fertilisers were applied to those plots carrying manures.

SUGAR: FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports, 4th May, 1922, as follows:—

In the course of April the districts of Mount Bauple and Bundaberg were inspected.

Mount Bauple.—There is a good showing of cane at Bauple. The crops, however, are just feeling the effects of the dry weather, but as they are generally all forward there is no need to anticipate serious deterioration unless the dry weather persists.

Cane varieties making a good showing are 1900 Seedling, D.1135, Q.1098, Shahjahanpur No. 10, E.K.1, Q.822, Q.813, and H.Q.426 (Clark's Seedling). The three most prominent varieties of these are probably M.1900 Seedling, D.1135, and Q.822. The former is especially doing well and should justify its cultivation on Bauple with more extensive planting.

Tillage of soil is uniformly good, although the texture in places could be improved by green crops. Practically the only cane to show any sign of disease is D.1135. Primary symptoms of striped leaf disease are appearing in patches of cane, and here and there the secondary stage of this disease is in evidence by the cracked and cankered appearance of the stem and the general weakening of the internode. Various kinds of fungi enter these cracks in the stem and destroy the soft tissue, with the result that on windy days the cane breaks off and falls to the ground. Growers should observe this variety carefully, especially in selecting plants.

The best method of plant selection is to survey the cane as it stands, before cutting the plant. Observe the leaf first and make sure the colour is a healthy green and free from rust or stripes. Then let the eye travel down the stem of the cane and observe whether the growth of adventitious roots is excessive, whether the trash is adhesive, and the occurrence of cracks and signs of deterioration in the stem. An experienced observer can, if he bears the foregoing in mind, at a glance form a very fair idea of the quality of the cane he is going to plant.

Fertilising at Mount Bauple is being carried out on a more liberal scale than hitherto. A mixture giving good results to M.1900 Seedling is 200 lb. sulphate of ammonia, 350 lb. superphosphate, and 70 lb. sulphate of potash per acre.

Mount Bauple farmers are taking the keenest interest in sugar-cane culture at the present time, and consider nothing too much trouble if it will benefit their district and assist in reaching that point when the land is producing the maximum. This can be done, however, only by continually improving the texture of the soil, by methodical crop rotation, by careful fertilising, and careful selection of plants and varieties. The district is a good one, but it is as yet producing far below its capacity.

Bundaberg.—Rain is just now wanted in the Bundaberg district. While most of the cane still is considerably resistant to drought, there will be a severe check if rains do not come during May. The Demerara 1135 appears to be suffering most, especially on the higher lands; the broader leafed canes are sheltering the soil better and preventing rapid evaporation. Conditions are not quite so dry on the alluvial loams as on the volcanics, although the degree of fertility is about equal, owing to the better texture of the red soils.

Growers are not being caused much loss at present by parasitic agencies or fungi, although the latter is here and there in evidence on the leaf of D.1135.

Good results are being obtained from meatworks manure on the red soils, while, generally speaking, these are giving negative results on the black loams. Cowpeas and stable refuse are the best manures for the heavier soils, owing to the necessity for improved texture. Excellent results are being obtained on the volcanic soils by rotating maize crops. Bare fallowing should not be done on the porous red loams. Leguminous crops should be grown and ploughed under as a soil-restoring measure.

A 25 per cent. basis would be a good method of working most Woongarra farms at present. That is 25 per cent. plant crop, and the same area of ratoons, standover, and land under renewal process. That would mean that once in four years the whole farm should have been green-cropped with either maize, cowpea, or whatever the grower considered gave the best results.

Varieties doing well at present are E.K.1, E.K.28, Q.813, H.Q.426, 1900 Seedling, Q.1095, Shahjahanpur No. 10, M.189, B.147, Q.1112, H.Q.77, and H.Q.285. The Shahjahanpur is showing considerable resistance to frost. The Shahjahanpur is developing into a good cane, the stick becoming thicker and the trash less adhesive.

Most of the other varieties are fairly well known now to the farmer. The E.K.1 is showing particularly well.

There is a considerable development of canegrowing at Elliot Heads. The soil is a light forest loam, which cultivates and drains satisfactorily. The farmers are doing well and extending and improving their holdings.

This country is well watered and free from frost. The farmers would do well to pay attention to the question of green-cropping.

ORGANISATION OF THE AGRICULTURAL INDUSTRY

The Queensland Producers' Association: How it will be Constituted.

Laying the Foundations for State-wide Rural Co-operation.

Steps have been taken to provide a completely unified national organisation for the Agricultural Industry, in accordance with the scheme of the Premier (Hon. E. G. Theodore), and those steps have led up to the establishment of an Association to be called "The Queensland Producers' Association." This Association is to be open to every producer in Queensland, and will embrace dairymen, fruitgrowers, wheatgrowers, small graziers, sugar producers, and general farmers.

THE QUEENSLAND PRODUCERS' ASSOCIATION.

The Association will consist of a Council of Agriculture, District Councils, and Local Producers' Associations. The Provisional Council already has been constituted, and consists of representatives of the dairying, fruitgrowing, wheatgrowing, sugar-producing, and general farming industries. The representatives of the dairying industry were nominated at a special conference representing all dairying interests, which was held in Brisbane on 24th March, 1922; the representatives of the fruit-growing industry at the annual meeting of the Southern Queensland Fruitgrowers' Society; the representatives of the sugar industry by the executives of the United Canegrowers' Association and Australian Sugar Producers' Association, and the representatives of the wheatgrowing and general agricultural interests by the State Wheat Board, which is itself a growers' organisation. The Minister for Agriculture (the Hon. W. N. Gillies) is the President of the Council. The objects of the Council are to co-operate with the District Councils, the Local Producers' Associations, the Department of Agriculture and Stock, and other bodies in such matters as:—

(i.) The development of the rural industries;

(ii.) Investigating and dealing with problems relating to the rural industries;

(iii.) Advising agriculturists with regard to matters which require scientific knowledge and training;

(iv.) Research on subjects pertaining to the rural industries;

(v.) Securing effective action for the controlling of diseases and pests generally;

(vi.) The securing of additional markets for the disposal of produce and of improved means of distribution;

(vii.) The securing of improved means of transport;

(viii.) The watching of markets and the commercial side of the rural industries generally;

(ix.) The general policy of standardising;

(x.) Extending the usefulness of the professional staff of the Department of Agriculture;

(xi.) Matters in relation to agriculture and production which may be referred to the Council by the Minister;

(xii.) Generally advising, assisting, and co-operating with the Department of Agriculture in all matters pertaining to the rural industries.

The Council has framed its constitution, and has from amongst its members appointed Standing Committees. These Standing Committees are—

COMMITTEE.	PERSONNEL.
Administrative ..	Messrs. S. G. Howe, F. J. Morgan, G. H. Pritchard, J. Purcell, H. C. Quodling, W. J. Short, and J. D. Story.
Transport .	Messrs. J. W. Davidson, A. Douglas, A. J. Muir, and W. Ranger.
Dairying	Messrs. A. Douglas, H. McAnally, J. Purcell, W. J. Sloan, and J. T. Tod.
Fruit	Messrs. T. H. Brown, S. G. Howe, W. Ranger, H. J. Ross, and F. M. Ruskin.
Sugar	Messrs. W. G. Batchelor, C. V. Hives, T. A. Powell, G. H. Pritchard, and W. J. Short.
Wheat	Messrs. H. McAnally, F. J. Morgan, A. J. Muir, H. C. Quodling, and R. Swan.

In order that a Standing Committee may get the best technical and expert advisers available, it has been approved that any Standing Committee may associate with it any officer of the Department of Agriculture or other person as the Council may from time to time determine. Persons associated with Standing Committees will act in a consultative capacity but will not have a vote. The duties of the several committees have been allocated as follows:—

(*a*) *Administrative.*—To deal with or advise in regard to matters relating to administration, organisation, staff, finance, and generally such matters as are not specifically assigned to other Standing Committees.

(*b*) *Transport.*—To deal with or advise in regard to all matters relating to transport, whether by road, rail, steamer, or otherwise.

(*c*) *Dairying.*—To deal with or advise in regard to all matters relating to the dairying industry.

(*d*) *Fruit.*—To deal with or advise in regard to all matters relating to fruit and vegetable industry.

(*e*) *Sugar.*—To deal with or advise in regard to all matters relating to the sugar industry.

(*f*) *Wheat.*—To deal with or advise in regard to all matters relating to the wheat industry, and also to such products as maize, cotton, rice, tobacco, &c.

The Council has referred the following matters for consideration as soon as possible by the respective Standing Committees, namely—

(A) Dairying—

1. *Production*—

(i.) To devise means of co-operation with the Lands Department regarding the opening-up of suitable lands for dairying purposes;

(ii.) To advise as to the best fodders to grow, and the best means of fodder and water conservation; need for revival of fodder-conservation campaign in good seasons, and consideration of "silo pool" system;

(iii.) To advise as to best pure-bred or grade stock available for purchase, &c., and general animal husbandry;
assistance in —

(iv.) To consider the best means of improvement in quality of herds by
1. Herd testing;
2. Purchase of stud stock;
3. Co-operation with private breeders and Herd Book societies.

(v.) To advise as to the best means of erecting standard dairy buildings, and of the purchase of dairy machinery and utensils.

2. *Manufacture*—

To advise in relation to—

(i.) The essentials of production of first-quality milk and cream;

(ii.) The organisation of suitable transport to factories;

(iii.) The essentials to be obesrved universally at factories to ensure uniformity of grade, including instruction to the suppliers of low-grade produce;

(iv.) The initiation of a uniform system of factory accounts and general factory management, with a view to reducing the cost of production;

(v.) The most economical method of procuring butter-boxes and other factory requisites.

3. *Marketing*—

To advise in relation to—

(i.) The best methods of packing and presentation for market;

(ii.) Co-ordination with Federal authorities in regard to grading and securing adequate information as regards defects noted by graders with a view to improvement of quality;

(iii.) The need for standardisation of brands to establish reputation for Queensland produce in interstate and oversea markets.

4. *Storage*—

To advise in relation to the best form of control of State cold stores.

5. *Distribution*—

LOCAL—

To advise in relation to—

(i.) The question of controlling local distribution, to ensure that dairy produce is retailed at reasonable rates according to actual quality, and that inferior produce is not offered for sale;

(ii.) The question of establishing pools or central distributing agencies.

INTERSTATE AND OVERSEAS—

To advise in relation to—

(i.) The question of adequate shipping facilities and the establishment of central co-operative distributing agencies in Southern capitals and overseas;

(ii.) The necessity for appointment at the Agent-General's office of a dairy produce expert of business ability to report on the arrival of Queensland consignments in London and keep in touch with marketing thereof.

It has also been mutually arranged that the Dairying Standing Committee of the Provisional Council of Agriculture and the Dairying Industry Advisory Board shall act conjointly in dealing with all matters relating to the dairying industry which have been referred to these bodies.

(B) Fruit—

To consider—

1. In conjunction with the Department of Agriculture and Stock, the problems relating to the fruit industry of this State;
2. The question of improvement of the productiveness of orchards by systematic instruction in fruit culture in all its branches, by scientific investigation to prevent loss through diseases and pests, or by other efficacious means;
3. The efficacy of the existing Diseases in Plants Act, and to suggest any amendment that may be considered necessary with a view to the more efficient control of diseases and pests generally by compulsory cleanliness of orchards and prompt destruction of infested fruit;
4. The question of standardisation generally, including fixation of marketing standards of various fruits, institution of co-operative local or central grading and packing establishments, and the necessity for additional legislative authority to provide for the above;
5. The question of improved methods of storage and transport, including experiments in and adequate provision of suitable storage for fresh fruits; to assist in the regulation and transport of supplies for local interstate and oversea markets;
6. Marketing and distributing problems;
7. The establishment of pools or co-operative local interstate and oversea selling agencies;
8. The efficacy or otherwise of the Farm Produce Agents Act as a protection to growers consigning fruit to local markets;
9. The institution of a campaign for the popularising of the use of fruit, and for the creation of a stronger demand for Queensland fruits throughout Queensland and the other States of the Commonwealth.
10. The question of utilisation of surplus supplies by the establishment of co-operative canning and preserving plants, and the standardisation, labelling, and marketing of such products.
11. The question of extending the benefits of the Co-operative Act, or any other means of establishing credit for the encouragement of co-operation in the industry.
12. The best means of securing the effective co-operation of existing associations and Government institutions, including the State cold stores, State canning works, State Produce Agency, State Advances Corporation, and the Railway Department.

(C) Sugar—

To consider—

1. The question of the improvement of the productiveness of sugar lands by the planting of the best varieties, by the use of fertiliser, &c.
2. The question of means of combating diseases and pests.
3. The question of the purchase of fertilisers and farm implements through co-operative channels.
4. The question of assurance against losses through cyclones, fire, grubs, &c.
5. The devising of ways for the economic use of present waste products.
6. The question of a credit system with a view to assisting new settlers or to assisting canegrowers affected by failure of crops in dry seasons or otherwise.

(D) Wheat and General Agriculture—

To consider—

1. The question of investigating, in conjunction with the Department of Agriculture and Stock, the problems relating to the wheat and general agricultural industries of the State.
2. The methods of production, marketing, storage, and distribution of wheat, and of general agricultural produce.
3. The question of the continuance of the policy of wheat pools and of the possibility of the extension of the policy of pools to other branches of the general agricultural industry.
4. The question of the purchase of all farm requisites through co-operative channels.
5. The question of wheatbreeding, and the question of pure seeds as applying to the industry generally.
6. The question of extending the benefits of the Co-operative Agricultural Production and Advances to Farmers Act, or any other means for the establishment of rural credit.
7. Consideration of any matters arising in connection with general agriculture throughout the State; including the question of the appointment of expert instructors in the cultivation of cotton, rice, tobacco, or other crops.

Subjects referred to the Dairy Advisory Board—

To consider—

(*a*) The question of investigating, in conjunction with the Department of Agriculture and Stock, the problems relating to the dairying industry of this State;

(*b*) The methods of production, manufacture, marketing, storage, and distribution of dairy produce;

(*c*) The question of the establishment of pools for dairy produce;

(*d*) The question of the co-ordination of the activities of existing co-operative companies;

(*e*) The question of the improvement of the productiveness of the individual dairy herds by general application of systematic herd-testing or any other efficacious means;

(*f*) The question of the purchase of all factory and farm requisites through co-operative channels;

(*g*) The question of fodder conservation;

(*h*) The question of extending the benefits of the Co-operative Agricultural Production and Advances to Farmers Act, or any other means for the establishment of rural credit.

DISTRICT COUNCILS.

In each district determined by the Council of Agriculture there is to be established a District Council. Pending the establishment of permanent District Councils, provisional district councils may be constituted upon the recommendation of the Council of Agriculture. These provisional councils will hold office for a period not

exceeding one year in the first instance. Each of the approved districts will determine the number of members who will constitute the District Councils. In the beginning there are to be fifteen districts, namely—

No. of District.	State Electorates included in the District.
1	The new State Electoral Districts of Cairns, Chillagoe, Cook, Eacham, Herbert.
2	The new State Electoral Districts of Bowen, Kennedy, Mundingburra, Townsville.
3	The new State Electoral Districts of Charters Towers, Queenton.
4	The new State Electoral Districts of Mackay, Mirani.
5	The new State Electoral Districts of Fitzroy, Mount Morgan, Normanby.
6	The new State Electoral Districts of Keppel, Port Curtis, Rockhampton.
7	The new State Electoral Districts of Bundaberg, Burnett, Musgrave.
8	The new State Electoral Districts of Burrum, Gympie, Maryborough, Nanango.
9	The new State Electoral Districts of Cooroora, Wide Bay.
10	The new State Electoral Districts of Aubigny, Bremer, Cunningham, Ipswich, Lockyer
11	The new State Electoral Districts of Bulimba, Logan, Murrumba, Nundah, Oxley, Stanley (also, *pro forma*, Metropolitan constituencies).
12	The new State Electoral Districts of Albert, Fassifern, Rosewood.
13	The new State Electoral Districts of Drayton, Pittsworth, Toowoomba, and Toowoomba East.
14	The new State Electoral Districts of Carnarvon, Warwick.
15	The new State Electoral Districts of Dalby, Maranoa, Murilla.

Additional districts and District Councils for those additional districts may be constituted from time to time upon the recommendation of the Council of Agriculture. Subject to the general control of the Council of Agriculture, each District Council may make its own rules with regard to the conduct of its business. The duties and functions of the District Councils will include:—

(1) To secure co-operation as far as possible amongst the primary producers in the area covered by the District Council, regarding their common requirements;

(2) To assist in developing schemes, in regard to production, marketing, standardisation, &c.

(3) To assist in suggesting schemes for making more profitable use of the State experts and the facilities generally of the Department of Agriculture;

(4) To assist in such matters as demonstrations of various kinds, co-operation in the purchasing of machinery, fertilisers, &c., promoting of herd-testing, fodder conservation, and to spread amongst the primary producers the latest and best information bearing on agriculture;

(5) Generally, such other duties and functions as the Council of Agriculture may determine.

Local Producers' Association—

As an auxiliary to the District Councils there will be Local Producers' Associations. In any centre in which there are (say) no fewer than (say) ten *bonâ fide* primary producers, a Local Producers' Association may be formed. A convenient centre will be chosen by the District Council concerned to be the headquarters of the District Council. The duties of Local Producers' Associations will include the following—

(1) To take the initiative in rural matters pertaining to the centre represented by the Association;

(2) To ascertain the requirements of the centre and to formulate a scheme for having these requirements met;

(3) To bring before the District Council, through the sub-district representative, requirements and problems which are not of purely local concern but are of common interest and concern;

(4) To support and assist the District Council in its efforts to promote the general prosperity of the primary producers;

(5) Generally, to co-operate with the District Council in enabling it to discharge its functions efficiently;

(6) To endeavour to co-ordinate and correlate the work of the Progress Associations and smaller societies, and to strengthen the work they are doing in so far as it relates to the rural industries.

CANE PEST COMBAT AND CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (dated 9th May, 1922) from Mr. Edmund Jarvis, Entomologist at Meringa, near Cairns:—

It is not generally known that we recognise at this laboratory at least fifteen different methods of combating our grey-back beetle during its grub stage.

These have been numerically arranged below according to their relative value as controlling factors, and may be very briefly enumerated as follows:—(1) Soil fumigants; (2) poison baits; (3) hand collecting; (4) soil repellants; (5) cultural methods; (6) larvicidal solutions; (7) introduction of parasitic insectivorous birds and mammals; (10) encouragement of indigenous parasitic and predaceous insects; (11) traps and cover crops; (12) introduction of bacterial diseases; (13) electrical controls; (14) mechanical control; (15) explosives.

It would, of course, be impossible for us to fully investigate *all* of the above-mentioned control methods, any one of the first seven of which could well engage the continuous activities of an entomologist. This fact may be more readily grasped when it is borne in mind that the abovementioned fifteen controlling factors relate exclusively to the grub stage; and that we recognise, and have been investigating so far as time permits, at least eight additional important methods of attacking *Lepidoderma albohirtum* during its aerial condition in the beetle form. Then again, various means of coping with the egg and pupal stages have been studied by us to some extent; with the result that quite recently (August to November, 1921) we have discovered that this cane pest can be destroyed during both of these obscure stages of its life-cycle by means of fumigating the soil with carbon bisulphide.

Naturally we are hoping that experimentation now in progress may yield positive results of an encouraging nature; but, as a rule, such success is preceded by a long series of negative results, which, however, serve a useful purpose by narrowing one's field of observation, thus tending to direct research work into more and more promising channels.

Obviously, the control methods entitled to first consideration in the list given above are those which may be supposed to hold, as it were, the key to the solution of the cane-grub problem.

In the writer's opinion the claims of No. 1 (soil fumigants) stand first and foremost as offering the best chance of successfully dealing with the grub stage of our grey-back cockchafer.

Under the heading of soil fumigants we have such substances as sulphurous anhydride; carbon bisulphide, &c., the latter of which we have used successfully against the grub.

If bisulphide could be administered quickly and evenly by means of suitable machinery it would, I think, be a decided step in the right direction and relieve the present situation very materially; but at the same time we do not, for several reasons, consider that nothing better can be found. During the past two months many fumigants have been tested by us with varying degrees of success. Time and again, as might be expected, the hopes raised by apparently conclusive laboratory experiments have been dispelled, as a result of field application; but, nevertheless, our results taken collectively have been sufficiently encouraging to well warrant closer investigation along similar lines.

Introduction of Parasites.

When reporting on this interesting question in July, 1921, I mentioned that various entomologists had been consulted with the view to obtaining reliable and comprehensive data regarding certain scoliid parasites likely to be serviceable if introduced into our cane fields. During the interval replies to my list of questions have come to hand from Dr. Guy A. K. Marshall, of the British Museum, and Professor S. Leffmans, Government Entomologist, Buitenzorg.

The former entomologist mentions six species of Scoliidae that might meet our requirements. One of these, which resembles our own digger-wasp in colour, but is slightly smaller, inhabits New Caledonia; while three are from Dutch New Guinea, one from the Solomons, and one from Aru Island. He is of opinion that a number of other species hitherto uncollected are likely to occur in the more accessible portions of British New Guinea.

It was very interesting to learn also that the principal insect enemy of our scoliid wasps has not, up to the present, been received by the British Museum from New Guinea; so that very probably wasps introduced from there may be immune from attacks of the hyperparasite that controls the increase of our own digger-wasps.

Professor Leffmans has kindly enumerated nine species of Scoliidae which are parasitic on scarabaeidae in Java. Three of these appear very promising, and might if introduced attack our cane-grubs; one of them, in fact (*Dielis thoracica* Fabr.), being similar in size to our own principal digger-wasp, and parasitic upon grubs of *Lepidiota stigma* F., a cockchafer belonging to the same genus as our cane-beetle *Lepidiota frenchi* Blackb. It also destroys the grubs of *Leucopholi rorida*, a cane beetle which is just the same size as our grey-back beetle.

Dielis thoracica, which is the most promising and abundant digger-wasp, occurs in East Java and on the south coast of Sumatra, where it is found practically throughout the wet season, and also during the dry monsoon of six months. In general it is confined to areas badly grub-infested, attacking second and third-stage grubs of four different scarabaeid beetles. Its life-cycle occupies from thirty-nine to sixty-two days, the intra-cocoon stage being longer than that of our digger-wasp *C. tasmaniensis* Sauss., which has a life-cycle of from forty-three to forty-eight days. Forty-two eggs have been obtained by dissection from one female of thoracica, but in all probability this species, like that of our own digger-wasp, is able to produce about twice that number.

In Java the adult wasps of thoracica frequent honey-bearing flowers belonging to the orders Compositae, Malvaceidae, &c., including those of the genus Sida, three species of which occur around Meringa, and are habitually visited by our Campsomeris wasps.

A Bombylid and some Conopid flies are suspected of being hyperparasites of *D. thoracica* and other scoliids in Java; but Professor Leffmans does not consider these of much economic importance.

On the whole the situation with regard to *D. thoracica* appears hopeful, and in the event of its hyperparasites not occurring in Queensland conditions here should be very favourable to the increase of this useful insect. This matter of secondary parasites, however, will be further studied.

At all events we purpose, as a preliminary step, to obtain with as little delay as possible living specimens of thoracica and of *Dielis javana Lep.* (another species likely to prove useful here) for purposes of breeding and study at this laboratory.

Owing to the length of the intra-cocoon stage of both these wasps Professor Leffmans believes that cocoons containing living pupæ could be successfully shipped to Australia. We hope, therefore, to be able to arrange for an exchange of parasites, and have advised him of our willingness to forward to Java cocoons of *Campsomeris tasmaniensis* in return for those of *Dielis thoracica* and *Javana*. This question of the introduction of parasites for our cane-grub will form subject for a special report in the near future.

A New Moth-pest of Cane.

We have to record another addition to our lepidopterous pests of sugar-cane, viz.:—*Spodoptera Mauritia* (Bois.) Hampson, one of the so-called grass or army worms, which affects cane in Hawaii; where, before the introduction of the mynah bird, it was reported that whole fields of cane were often completely destroyed.

The eggs of this noctuid moth are laid in batches of an oblong or circular outline, consisting of sixty or more eggs deposited side by side and covered with a pinkish-brown felted mass of hairs taken from the body of the insect. Each female probably deposits in all from 350 to 400 eggs, affixing the batches to leaves of bushes, ceilings, walls, &c., but usually in situations immediately over or close to herbage, and the tiny larvæ upon hatching drop down on threads of silk until reaching grass blades. About eighteen days later, when fully grown, they measure 1¾ inch in length, and are then greenish-brown, with yellowish subdorsal and spiracular bands, the former having a dark line on the lower edge, and the latter being placed just below spiracles. The anterior dorsal portion of each body segment excepting the first encloses two triangular black patches, which are very variable, and in some specimens appear as short thick streaks. Spiracles, dark-brown; ventral surface greenish-yellow; head greenish-brown, with face yellow, mandibles dark red. Body cylindrical, tapering slightly towards each end, and bearing a few scattered black hairs.

Pupation takes place underground, this stage occupying a period of three weeks.

Caterpillars of this grass-worm were observed by the writer defoliating cane that was growing in cages used for breeding tachinid fly parasites.

Fortunately this new moth-pest is of very minor importance at present, and not likely to prove troublesome in the future.

It makes the eighteenth lepidopterous insect observed injuring sugar-cane in Queensland; and is probably controlled naturally by a number of parasitic and predaceous enemies.

GRAPE CULTURE IN QUEENSLAND.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In the course of the past twenty-five years a great deal of very useful information and sound advice relating to the culture of the grape in this State has appeared from time to time in the *Queensland Agricultural Journal*, as well as in the form of special bulletins.

In the early days of the *Journal* Mr. E. H. Rainford, then Queensland's viticultural expert, contributed a number of excellent articles on all branches of the industry, and his writings were followed by those of Mr. Chas. Ross, late Instructor in Fruit Culture, who placed on record a description of many varieties of grapes that have been tested in this State, as well as the districts most suitable for their culture. Mr. Ross also contributed useful advice on the culture of grapes and the methods of pruning best suited to the several varieties. In addition to the information supplied by these departmental officers, there are many references to grape culture and wine making scattered generally throughout the back numbers of the *Journal*, including a very interesting series of articles by Mr. Gattino, of Charleville.

Matter relating to viticulture is so widely distributed among departmental publications that it is impossible for a beginner to obtain the instruction he requires in a readily available form. It is therefore my intention to endeavour to condense the information that has previously been given in departmental publications and issue it in pamphlet form. We are constantly receiving inquiries from persons who have recently taken up agricultural or horticultural pursuits and who do not possess even the most rudimentary knowledge of the conditions required for the successful culture of the grape or of the treatment it requires; and it is to help these new growers that I am preparing this pamphlet.

As I am writing more for the beginner than for the expert vigneron, it is advisable to start from bedrock, and this necessitates a knowledge of the origin of the grapes which are grown in this State.

All commercial varieties of grapes belong to the genus *Vitis*, of the natural order *Ampelidæ*, and several species belonging to this genus are cultivated.

Of the genus *Vitis* the species *Vinifera* is by far the most valuable and the most widely cultivated, as it embraces all our so-called European varieties and includes all the best wine, table, and drying grapes. The home of *Vitis vinifera* is in Persia and Armenia, and from there it spread all over Europe and eventually to all the temperate and semi-tropical parts of the world. It does not thrive in the tropics. It is a deciduous plant, and therefore requires to be grown in a climate having a sufficiently cold winter to permit of its undergoing a complete rest. It can stand great summer heat, and thrives in hot dry climates when grown in a suitable soil, which is kept in a state of perfect tilth, even though there is little or no summer rainfall, provided there is a sufficiently good winter rainfall; but when this is lacking irrigation is necessary.

At the same time, it can stand many degrees of frost when in a dormant condition, although it is very easily injured by frost during the period of active growth.

The grapes belonging to this species, therefore, require a sufficiently cold winter to undergo the necessary rest and a warm, dry temperature when the fruit is ripening. A wet climate is not suitable.

It will thus be seen that the purely coast districts of Queensland are not the most suitable in which to grow *V. vinifera*, as the winter temperature is too high, especially in the more northern parts, where also the summer is frequently so moist and humid that it is conducive to the development of fungus diseases, but not favourable to the proper development of the sugar contents of the fruit. For this reason, it is only when we have a hot and dry summer on the coast that we can grow certain varieties of *V. vinifera* to perfection, as under normal climatic conditions it is only in a very few favoured localities and by the exercise of especial care that these varieties can be grown successfully.

As one goes back from the coast the conditions improve, and as soon as the main coast range is crossed in the southern half of the State the growing of many varieties of *V. vinifera* is possible, though several kinds of wine, table, and drying grapes that are susceptible to fungus diseases require to be grown even further west. This refers particularly to the growth of drying grapes, as, in order to produce a good raisin, sultana, or other dried grape, it is essential that the grape shall develop a very high percentage of sugar in its juice, and it can only do this in a hot and dry climate. This accounts for the excellent raisins and sultanas produced in the Murray River districts of Victoria and South Australia, where the normal summer conditions are hot and dry.

Certain varieties of *V. vinifera* do very well in the Central district, and Westwood, which is only some 30 miles west of Rockhampton, produces excellent Muscats, both black and white, as well as many other good varieties of table grapes. Many varieties also grow to perfection on the Peak Downs, desert country, and even further west, when given the necessary care and attention. In Northern Queensland a few varieties can be grown successfully at Charters Towers, Pentland, and even further inland; but they cannot be grown on the coast and do not succeed well in the Cairns Hinterland, even at high altitudes.

It will thus be seen that the successful cultivation of varieties of *V. vinifera* is confined to localities in which the climatic conditions are favourable for its growth, and that it is unwise to grow them elsewhere. Thousands of cuttings have been planted from time to time under totally unsuitable climatic conditions, all of which have proved a complete failure. Despite this experience, similar varieties are still being planted year by year under similar conditions. Failure under such conditions is inevitable, and it is a strange fact that many persons refuse to accept well-known facts until they are proved by their own experience.

Grape vines belonging to *V. vinifera* are easily distinguished from other species of *Vitis* by the leaves, which are more or less deeply lobed and of which the edges are toothed or serrated; the leaves are also shiny when young and generally smooth. The wood is stouter and the nodes or joints much nearer together than in other species. The skin of the fruit adheres to the flesh, which is juicy and firm, and the seeds are of a different shape to those of other species.

There are very many individual varieties of vinifera the fruit of which varies widely in size, colour, flavour, period of ripening, and production. As already mentioned, all the best drying, table, and wine grapes belong to this species. Several wild species of Vitis have been cultivated in America and imported varieties have been grown in Queensland for many years. They are all included under the general heading of American grapes and have proved capable of being grown under conditions that are by no means favourable for European varieties, for not only can they be grown successfully on our Downs country but also on the country lying between the Downs and the coast, as well as the actual coast country, excepting our most tropical districts, where no variety of cultivated grape is found to thrive.

American grapes belong to four species ("American Grape Growing," Husmann), viz.—

1. *Vitis labrusca,* the Northern Fox grape.
2. *Vitis æstivalis,* the Summer grape.
3. *Vitis cordifolia* or *V. riparia,* the Winter or Frost grape or the Riverside grape.
4. *Vitis vulpina,* the Southern Fox grape.

In addition, there are several other species of Vitis of which there are no cultivated varieties. All American grapes are more or less resistant to the fungus diseases that attack European grapes, and they will thrive in a more humid climate. Some varieties, and particularly hybrid varieties, either pure American hybrids or American-European hybrids, are also very resistant to phylloxera and are not injured to any appreciable extent by this destructive insect; still they are not immune, as there is no such thing as an absolutely blight-proof stock. Several of these hybrids are used as resistant stocks on which to graft varieties of *vinifera* for which purpose they are admirably adapted, as many of them are very vigorous growers and possess a fine root system. American grapes are distinguished by their leaves being entire and not lobed, and being always more or less downy or felted on the under side; by their long jointed thin wood and frequently rampant growth; and by the skin of the fruit separating readily from the flesh, which is of a slimy nature and has more or less of a foxy taste, much more noticeable in some varieties than in others.

American grapes are of considerably less value than the better European varieties; still they are valuable to this State in that they can be grown successfully in the coastal districts where other grapes fail.

A large number of American grapes have been introduced into this State, of which the following varieties are recommended:—

Labrusca type: Goethe, Iona, Martha, Wilder, Improved Isabella, or Pierce.

Æstivalis type: Herbemont, Lenoir.

Cordifolia type: Elvira.

Vulpina type: Scuppernong.

Of these varieties, Lenoir is only valuable for wine making. It has dark purple flesh, and its juice is so dark that it is valuable for giving colour to red wines; and Scuppernong, though highly spoken of in the Southern States of America, has so far never been grown successfully here, though our coast climate should suit it.

SOILS SUITABLE FOR GRAPE CULTURE.

Grapes can be grown on nearly every kind of soil, provided it possesses good natural drainage and has no hard-pan or cement underlying the surface soil. Good drainage is essential, as no grape vine will thrive with stagnant water at its roots.

Good free loams, sandy loams, alluvial loams, and even fairly heavy loams having good drainage are all suitable for grape culture; but the best soil is a deep free warm loam, either of a granitic, basaltic, sandstone, or limestone origin or of an alluvial nature.

Very rich soils are not as a rule suitable, especially in the coast districts, where the rainfall is heavy, as the vines grown on them tend to produce wood rather than fruit and are more liable to disease.

The dominant plant food of the vine is potash; consequently granitic soils rich in potash-yielding felspar, such as those of parts of the Stanthorpe district, are noted for the quality of the fruit they produce, and the sandy soils of our Western country, which also contain a supply of potash in an available form, produce fruit of high quality both for wine and table use. A high sugar content in their juice is developed under the hot and dry conditions that govern their growth.

Soils rich in lime are also very suitable for grapes, but as already stated any good, free, well-drained, loamy soil will grow good grapes if the land is properly prepared prior to planting and the vineyard is looked after when planted.

Situation of Vineyard.—In districts not subject to late spring frosts the situation of the vineyard is of very little importance—in fact, provided all other conditions are satisfactory, the more level the land is the better. Where late spring frosts, however, have to be taken into consideration, such as in the Granite Belt, the best situation is one well protected from all heavy and cold winds and that does not face the rising sun, so that it will be some way above the horizon before its rays actually strike the vineyard.

PREPARATION OF THE LAND.

This is summed up in one word—it must be *thorough*. Old writers on the grape always give very explicit instructions regarding the preparation of land prior to planting the vines, both when the vines are grown under glass and in the open. In the case of the former the soil of the bed in which the vines are planted is very carefully prepared or compounded and perfect drainage is provided, and in the latter the soil is trenched at least two spits deep and brought into a very high state of tilth. In the early days of grape-growing in Australia trenching the soil was considered essential, but experience has shown us that it is not necessary and that the heavy expense incurred is not warranted. The land for the vineyard must be thoroughly cleared—that is to say, all trees must be properly grubbed out and all roots run to a depth of at least 18 in. from the surface, deeper if possible, so as to permit of the land being ploughed as deeply as the surface soil will permit. The land should thus be subsoiled to at least 18 in., and deeper if it is possible to procure the power necessary for the work. After clearing, running all roots, and burning off, the land should be ploughed and cross-ploughed as deeply as the surface soil will permit; but the subsoil should not be brought to the surface. The soil proper should then be worked down fine and brought into a good state of tilth. It should then be again ploughed with a single-furrow plough, and a strong subsoil plough should follow in the furrow and break or stir up the subsoil as deeply as the power available will permit, but no subsoil should be brought to the surface. A powerful single-disc plough with a large disc 26 to 30 in. in diameter, followed by a very strong subsoil plough fitted with a bull-tongue share, makes an excellent combination. Land so prepared encourages the deep rooting of the vine—a very important consideration in our climate, where we are subject to long dry spells and depend mainly on intensive and deep cultivation to maintain the necessary supply of moisture in the soil.

Surface roots are the first to suffer during a dry spell, and further they are in the way of the cultivation that is so essential for the retention of moisture.

As already stated, the preparation of the land must be *thorough*. It may cost a little more at the start, but it will pay handsomely in the long run. "Good enough" is not *good enough* unless it is *thorough*. Many a vineyard is spoilt by planting the vines before the land is in a fit state to receive them.

PLANTING.

Having prepared the land for the vineyard as described, it is ready for planting, but the actual planting should not take place until the sap starts to rise in spring, for if planted then the cuttings will develop roots at once and start into growth very quickly; whereas if planted whilst the cuttings or vines are completely dormant there is always a chance of their drying out before starting growth. Given sound, well-matured cuttings and the land in perfect tilth, every cutting should grow, if

properly planted, at the right time. If unrooted cuttings are used, and they are by far the most satisfactory if they are properly treated—that is to say, if they have been cut from well-matured, healthy wood that has not been allowed to dry out—they are best planted with a bar. The method of doing so is as follows:—One man makes a hole in the soil of sufficient depth to take the cutting, and a second man places a cutting in the hole and holds it with one eye at the surface of the ground and one eye only above the ground. The first man inserts the bar into the soil at an angle a short distance from the cutting and then pushes the soil with the bar towards the cutting, thus closing the hole first made and tightening the soil all round the cutting. The soil must be quite firm all round the cutting and at its base, otherwise the cutting will dry out. A properly planted vine should be set so firmly in the soil that it can only be pulled out by the exercise of considerable force. As the bar is removed from the soil, the second hole made should be filled in with the bar. One of the greatest mistakes that is frequently made not only by beginners, but by older vignerons, is to leave far too much of the cutting out of the ground; 2 in. or 3 in. is ample, and yet one frequently sees more than 1 ft. left in the air to dry out. It must be remembered that no matter what type of pruning is to be eventually followed, only one cane coming from as near the surface of the ground as possible is required to form the future main stem of the vine. If rooted vines are planted instead of cuttings, they require very careful treatment and handling, for if the roots are exposed to the air for any time they are seriously injured.

On the receipt of rooted vines from the nursery they should be examined very carefully and all surface roots should be removed, only the roots that have started from the base of the cutting being allowed to remain, and these should be shortened back to a couple of inches in length. All the previous year's growth of wood should be pruned away excepting the best and strongest cane, which should be cut back to not more than two eyes in length, and from one of these eyes the cane destined to form the future main stem of the vine will be produced. Rooted vines cannot be planted with a bar, but if the land has been prepared as described a comparatively small hole will suffice. The vine should be set at about the depth at which it was growing in the nursery, and the soil should be packed firmly round it in order to permit its drying out. If the soil is very dry, a little water can be placed in the bottom of the hole at the time of planting, so that the base roots will come in contact with the moisture, and fine dry soil should then be used to fill in the hole. The distance apart at which to plant vines depends on the nature of the soil, its power to retain moisture, and the rainfall of the district in which the vines are grown.

European vines are grown both on a trellis and in the bush form, the latter with or without stakes as may be required; but American grapes must be trellised.

European grapes when trellised should be planted at from 6 ft. to 8 ft. or even more apart in the row and not less than 10 ft. between the rows, but when grown as a bush they should be planted on the square, not less than 8 ft. by 8 ft., or, better still, 10 ft. by 10 ft. and even wider planting in hot, dry districts. Don't crowd your vines; it pays to give them plenty of room, especially in dry seasons. American grapes require more space, and should be planted 12 ft. or more apart in the row, as many varieties are strong growers.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 11.

YELLOW-WOOD (*Flindersia Oxleyana*).

Unlike a large number of our scrub timbers, the yellow-wood is well known, and has been used a good deal for coachbuilding, railway carriage frames, and general joinery work. The trees attain 140 ft. in height and a barrel diameter of about 3 ft. As a rule the barrel is not flanged. The bark is grey or greyish brown, very scaly, and is shed in oblong pieces: when cut, the outer part is seen to be brown and the inner part dull yellow; it measures about ¾ in. thick on a tree with a barrel diameter of 2 ft. 2 in. It has been observed that the trees flower in December and January. The yellow-wood is not found growing naturally outside of Australia, and has been observed in scrubs of the coastal area from the Richmond River, N.S.W., to Gympie. The photograph of the capsule shows that this species is allied to the crow's ash and the Queensland maple, both of which also belong to the genus Flindersia. As an ornamental tree the yellow-wood deserves a prominent place in parks, gardens, and streets, but up to the present it has been almost entirely neglected in this respect. The accompanying photographs and the field notes given above will enable the reader to recognise the tree if it grows in his district.

Photo. by the Authors.]

PLATE 72.—THE YELLOW-WOOD (*Flindersia Oxleyana*), IMBIL SCRUB.

PLATE 73.—THE YELLOW-WOOD (*Flindersia Oxleyana*).

A.—Seed. B.—Placenta. C.—Capsule. C, natural size; remainder to scale.

ANSWER TO CORRESPONDENT.

F. C. MOLLER, Teviotville.

In reply to your letter of 12th May, asking for advice as to the advisability of laying down a concrete floor waterproofed by the addition of oil, this Department communicated with the Public Works Department on the subject, and received the following memorandum:—

"*RE* WATERPROOFING CONCRETE BY ADDITION OF OIL.

"The oil used should be of a heavy, viscous nature, of mineral origin. A suitable oil could probably be obtained from the Vacuum Oil Company.

"The concrete proportions should be:—1 bag cement, 2½ cubic feet sand, and 5 cubic feet broken stone; or, 1 bag cement, 1½ cubic feet sand, and 6 cubic feet graded gravel. Mix the concrete as usual, and after the water has been added, and the concrete turned twice wet, then add the oil and turn twice again, raking the heap while the concrete is being shovelled. The oil will be quickly emulsified and thoroughly mixed with the concrete.

"The oil should be in the proportion of one-tenth by volume to the cement used. The water employed in mixing the concrete should be clean rain water.

"The resulting concrete will be dense and impervious to water, but it is uncertain as to whether it would resist the action of animal urine if used in cow bails."

SCIENCE NOTES.

BY EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Under this heading it is proposed each month to record discoveries likely to interest scientists and relating to insect pests of sugar-cane and their parasites.

EARLY STAGES OF *MACROSIAGON CUCULLATA*, MACL.

A hyper-parasite of the above genus—viz., *M. pictipennis*, Lea—has, since the year 1915, been considered an enemy of our useful digger-wasp parasites (*Campsomeris tasmaniensis*, Sauss., and *C. radula*, Fabr.).

Nothing, however, was known respecting the life-cycle of these curious beetles until quite recently (December, 1921), when Mr. W. Cottrell Dormer, Assistant Entomologist, had the good fortune to observe specimens of *cucullata* in the act of ovipositing on the under-surface of leaves of *Ficus opposita* and *Urena lobata*.

The eggs, which are white, of elliptical form, and measure 0.45 x 0.15 m.m., numbered a hundred or more, and were placed close together but without definite arrangement amongst the hair of the leaf, over an area of about 1½ square inches. During the period occupied by the egg stage they were kept under quite dry conditions in glass tubes, and a fortnight later had commenced to darken, becoming black and finally hatching after 17½ days.

The minute and active triungulin, representing the first larval stage (figs. 1, 2), resembles in general appearance and structure that of a closely related European species (*Rhippiphorus paradoxus*), and, like that insect, probably frequents flowers visited by hymenoptera in the hopes of attaching itself to some suitable wasp and being carried into its nest. If successful, it probably waits until the egg of its host hatches, and then enters the body of the young maggot. A Campsomeris wasp was placed by us for a few seconds in a large test-tube containing about 25 triungulins, and then put under chloroform. Examination revealed numbers of the latter tightly embracing various hairs on the tarsi, clypeus, neck, pronotum, &c., of the wasp. Upon reviving, and discovering the presence of these minute enemies, it endeavoured to brush them off, but only succeeded in killing one and removing two others. Subsequently, these triungulins were carried underground by the host, and after oviposition had taken place one of them remained on the egg attached to the paralysed grub for three days, making no attempt to pierce the chorion, but apparently awaiting the appearance of the maggot of the wasp. The triungulin itself is a black and almost microscopic insect, barely visible to the naked eye, measuring 0.53 x 0.16 m.m.

By the aid of a sucker situated ventrally on the anal segment, it is able when necessary to stand on its tail, thus leaving all legs free, when about to lay hold of wasps visiting the flowers.

1.—Unflattened specimen, showing convexity of dorsal surface.

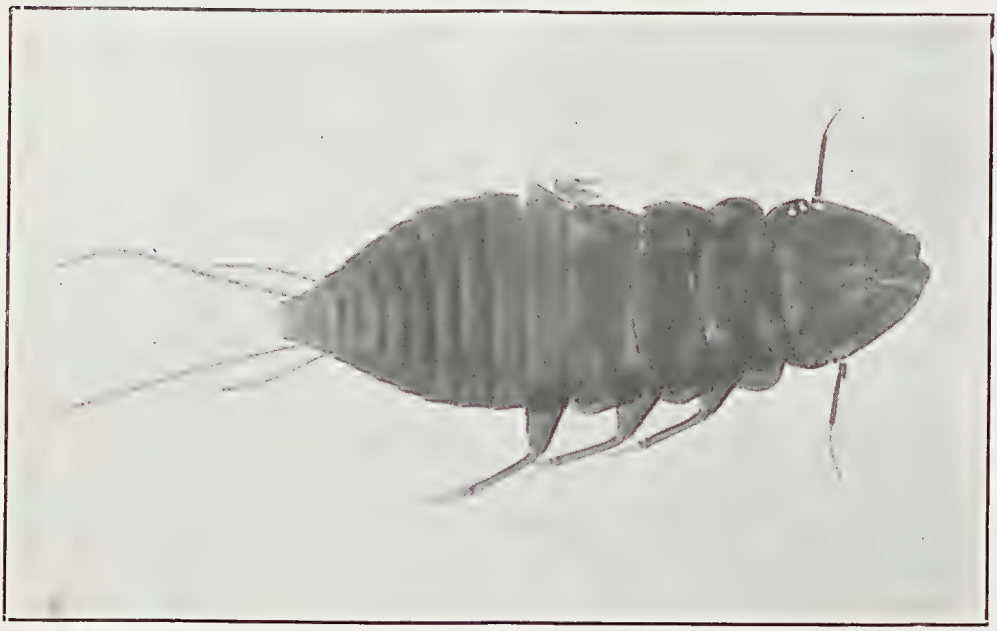


Photo. W C. Dormer.]

2.—Specimen mounted in balsam (magnified 153 diameters).

PLATE 74.—TRIUNGULIN OF MACROSIAGON CUCULLATA, MACL.

FRUIT FLY INVESTIGATIONS.

[SECOND PROGRESS REPORT.]*

BY HUBERT JARVIS, Entomologist in Charge of Fruit Fly Investigations at Stanthorpe.

The Minister for Agriculture and Stock (Hon. W. N. Gillies, M.L.A.), has made available the Second Monthly Report, dated 15th April, of Mr. Hubert Jarvis, Entomologist in Charge of Fruit Fly Investigations at Stanthorpe, received through Mr. Henry Tryon, Entomologist-in-Chief.

In forwarding the following report, I would direct attention to the transference—as narrated therein—from Brisbane to the "Granite Belt" of Southern Queensland, of the fruit fly parasite Diachasma Tryoni (Cameron) Silvestri as being the first of several hymenopterous parasites of fruit flies that it might be found practicable to utilise in controlling these "pests" both there and elsewhere in the State.

(*Sgd.*) *HENRY TRYON,*
Entomologist-in-Chief.

This insect, originally discovered by this Office in 1892 *and referred at the time to the genus Opius (Brœonidæ, Hym.) (Vide Tryon, H., "The Parasite of the Fruit Maggott," Trans. Nat. Hist. Soc. Qld. I. pp.* 8-9, *Brisb.* 1895) *was in* 1911 *named Opius Tryoni by Cameron, but placed more correctly in the genus Diachasma, by F. Silvestri, in* 1914.

Already in 1910 *W. B. Gurney published important information regarding its parasitic habit, in New South Wales, confirming what we had previously stated as to the extent that this was displayed in Queensland in relation to our commoner fruit fly. In* 1913 *the abovementioned Italian savant conveyed this Diachasma to Honolulu, an action on his part that led to its general distribution throughout the Hawaiian Islands, for since then it has been continuously bred and distributed.*

Nothwithstanding in realising this event it was only liberated on August, 1914, *it was by the end of this year found already destroying the fruit fly of coffee (C. Capitata) in the Kona Valley to the extent, in some instances, of* 40 *per cent. And, although its services in parasitising fruit fly maggots in the larger fruits are limited, by reason of the shortness of its ovipositor (relatively long, however, for a fruit fly braconid) it is considered by us that it should prove useful in reducing the strength of the earlier broods of fruit flies at Stanthorpe, that are yielded by maggots infesting cherries and certain small early ripening plums.*

(*Intld.*) *H.T.*
20-4-22.

FIELD OBSERVATIONS.—PERIOD, 14TH MARCH TO 14TH APRIL, 1922.

Wintering of Fruit Fly.

The search has been continued for the pupæ of the fruit fly (*Dacus Tryoni*) in various districts, under the following orchard trees:—Apple, peach, nectarine, plum, and apricot, whose fruit crop (three weeks or more gathered) had been badly infested with fruit fly maggots.

The soil to a depth of 1 foot right around individual trees has been carefully sieved and examined, but no live pupæ have been so far encountered. The ground under two large apricot trees, "whose entire crop was ruined by fruit fly maggots," (*vide* W. Warry, Esq., Stanthorpe) gave, too, negative results, although many empty pupa cases were secured.

Activity of Fruit Fly.

The Queensland fruit fly (*D. Tryoni*) was on the 20th March, 1922, observed in numbers ovipositing in ripe quinces at The Summit; ten flies were captured on the fruit in about half an hour, one of the number proving to be a female specimen of *D. Tryoni var. Solani* (The Solanum fruit fly.

The quince on which this fly was captured is at present under observation, in this office, and it will be interesting to see if the "Solanum" fly will (contrary to our present belief) attack cultivated fruit.

Two female examples of the Solanum fly (*D. Tryoni* var. *Solani*) were found at Ballandean (Mr. D. Watts's orchard) in a "Magnet" trap baited with "Magnet" lure. This trap had been on the trees for about eight weeks (*vide* D. Watts, jnr.).

* Early in February of this year Mr. Hubert Jarvis, of the Division of Entomology, Department of Agriculture and Stock, was appointed to investigate the fruit-fly problem in the Granite Belt. His first progress report was published in the May Journal.

Longevity of Fruit Fly.

In order to ascertain how long the fruit fly will live, 100 are being kept in large glass jars in the laboratory, and fed twice daily.

These flies, hatched from 3rd to 8th April, 1922, are all at present alive and active.

Destruction of Maggot-Infested Fruit.

Some considerable time has been devoted to examining "dumps" where fruit has been burnt, with a view to determining the safety or otherwise of this method of dealing with maggot-infested fruit.

Under one such dump, where a large quantity of peaches had been burnt, forty pupæ were secured. Most of these pupæ were found about ½ an inch deep in hard soil, and under the space occupied by the centre of the fire; but some, however, were concealed under logs and other suitable cover at the edges of the fire. From these forty pupæ, taken 23rd March, 1922, twenty-six fruit flies hatched between the 5th and 10th of April, 1922.

This seems to indicate that burning fruit on the ground is not a reliable means of destruction, as many of the fruit-fly maggots would, on feeling the heat, if not earlier, escape from the fruit and enter the soil, therein pupating, and in due course giving rise to more fruit flies.

The plan adopted by many orchardists of first laying a timber foundation, on which to deposit the fruit, and then building the fire on top, should prove more effective than when this procedure is not followed, although I am convinced that a good percentage of maggots would escape even then.

A practice most strongly to be condemned (fortunately only one instance has come under my notice) is the dumping of fruit on *uncleared land* (adjoining the orchard) and covering the same with brushwood, omitting any further action.

The instance referred was brought to light at The Summit. A large quantity of fruit had been carted to the spot and dumped there, sticks and brushwood having been placed on top, presumably with the object of screening it from view. A large number of living pupæ were found in the soil under the fruit, but from by far the bigger number some thousands of flies had already emerged, leaving only an abundance of empty pupæ cases.

It is difficult, indeed, to believe that any orchardist could be guilty of such a practice, especially being aware (as he must well be) of the serious situation created by the fruit-fly as a pest in the Granite Belt, and also of the co-operative effort being made by all intelligent growers (the majority) to control this pest.

While such a procedure is possible, however, little hope can be entertained of a practical control of the fruit-fly in the Stanthorpe area.

Drowning Fruit-fly Maggots.

Experiments have been made in order to determine how long the maggots and papæ of the Queensland fruit fly (*D. Tryoni*) will live (immersed) in water.

Fruit-fly maggots and pupæ have been placed in glass jars and covered with 2 to 3 inches of water for three, four, and five days.

Results prove that maggots and pupæ perish if immersed in water for four or five days.

Data relating to this experiment will appear in a later report.

The above experiment would suggest drowning as a satisfactory and safe way of dealing with the maggots in infested fruit.

Any old tank or large barrel would serve the purpose. The fruit should be covered with at least 2 inches of water, and left for five days. It should then be taken out and ploughed in for manure (if so desired) without any danger of fruit flies hatching.

Burying the Maggot-Infested Fruit.

As regards burying fruit, it has yet to be proved how far the fruit fly (*D. Tryoni*) will burrow through soil or sand after emerging from the pupa. Instances are on record (*vid.* Annals of Ent. Soc. America, vol. vii., No. 3, 1914) of the melon fly (*D. Cucurbitæ*) burrowing upwards through 2 feet of wet sand.

Experiments to test this in relation to our own fly (*D. Tryoni*) are being carried out, and results will be available later.

CONTROL MEASURES.

Natural Enemies.

On the 25th of last month a visit was made to Brisbane and districts with a view to introducing to the Stanthorpe area the fruit-fly parasite (*Diachasma Tryoni*, Cam. (*Braconidæ*)). After conference with the Entomologist-in-Chief (Mr. H. Tryon), three days were spent at Goodna collecting this parasite, with no small success.

About forty specimens were secured alive (the majority being female) and also a good deal of infested fruit likely to yield additional specimens.

These parasites were successfully transferred in glass tubes to this district, with only a few casualties. Twenty were liberated, and the remainder kept for experimental work and for special observation.

This parasite (*Diachasma Tryoni* Cam.) is a small, active, red-coloured wasp, 8 to 9 mm. (just over ⅓ inch) long. The ovipositor (egg-layer) in the female is almost as long as the rest of the body. The insect is furnished with ample wings and very long sensitive antennæ.

Opius Tryoni Cam. may be seen on warm days flying around and lighting on maggot-infested fruit. If watched closely it will be seen to pass with quite short, jerky movements over the fruit, touching the same from time to time with its waving antennæ, its whole attitude suggestive of listening. When, possibly, by a sense of hearing or some other instinct, it has located the fruit-fly maggots beneath the skin, it stops, raises its body to a perpendicular position, and inserts its ovipositor in the fruit, working it in by downward movements of the body until it is buried about ⅛ of an inch deep in the flesh. It then, by an upward movement, withdraws its ovipositor, cleans it with its posterior pair of legs, and almost immediately repeats the operation at another spot.

So persistent and active are these little wasps that specimens under observation have made as many as twenty punctures in the fruit in twenty-five minutes, the process taking from ¾ to 1¼ minutes. It is probable that some punctures serve as probes to locate the prey.

The *Opius* can only reach the maggot when the latter is close underneath the skin (*i.e.*, full grown and on its way out of the fruit), or approaching the surface in breathing.

An effort is being made to breed these parasites in the laboratory, and it is hoped that a control method of value may thus result.

Under these laboratory conditions as many as five of these parasites have been observed ovipositing at once on one individual fruit.

(*Note.*—A pressing need at present is an insectary, where these and other insects could be bred and studied under natural conditions.)

Trapping and Luring.

Owing to the lateness of the season and the almost entire absence of fruit, trapping experiments in the field, by means of lures, no longer give good results, although a few flies are still being caught.

Five fruit flies submitted on 8th April, 1922, for identification by Mr. Schneider, of Broadwater, and said to be caught with a new lure (his own discovery) proved to be all female examples of *D. Tryoni*, the Queensland fruit fly.

Useful Insects.

The so-called "grey maggots," destroying the woolly aphis of the apple and doing very good work indeed in this direction, prove to be the larval forms of two species of Syrphidæ ("Hover flies") *Syrphus viridiceps*, Macq. and *Syrphus pusillus*, Frog.

Both species are renowned (as are so many members of this family) aphis-eaters. The adult flies (bred in this office) are handsome insects of a bronze-black colour, the body banded with bright yellow.

The Hover fly lays its egg among or close to the woolly aphis (*Schizoneura Lanimera*), and the young larva, on hatching, immediately starts feeding on the abundance of food surrounding it that these insects constitute.

When full grown (above ½ an inch long) it seeks a retired spot and turns to a pyriform (pear-shaped) dark-brown chrysalis or pupa, from which in due course it comes as the adult Hover fly.

Unfortunately, the Hover flies also have their enemies, the two species referred to being attacked and parasitised by a small braconid wasp. This happens to these flies when in the maggot stage and whilst they are too feeding on the woolly aphides. Two specimens of this Hover fly parasite have been bred in this office.

Tomato Fly.

As was anticipated, maggots found in tomato and bred in the laboratory prove to be the tomato fly (*Lonchaea splendida*), and not a true fruit fly (Trypaneidæ).

Office Work.

I am indebted to the following orchardists and others for donations to the official collection of economic insects:—Mr. W. Ranger, Mr. A. Paget, Dr. J. F. Roberts, Inspector J. Henderson, Inspector F. Williams, and Mr. F. Sellars (Stanthorpe).

It will, it need scarcely be stated, be of the greatest assistance to us to receive from orchardists and others interested, specimens of all insects that come under their notice, whether useful or otherwise; thus, and by our own efforts also, will a valuable collection of economic insects be built up, and be of much service, both as a means of study and for future reference.

GENERAL NOTES.

The Secret of Potato-growing.

"The great secret in potato-growing," continued Mr. Hiam, "is to get the proper seed, and the system adopted in Jersey could be followed with advantage. The potato-growers there secure all their seed from their own stocks. The greenest and most vigorous plants are dug up for seed when the potatoes have reached about three-quarter growth. These potatoes are put in boxes, and left in the sun until they get thoroughly green and hard, when they are put away in a shed, where they will be secure from frost for the winter. They are examined about every ten days to see that they are not sprouting too much, and this is prevented by giving them more air, or moving them into a cooler position. It is advisable not to let them grow sprouts more than a quarter of an inch in length. Through getting these potatoes green and hard in the sun, when planted, wire worm and other pests will not interfere with them, and should the land be wet, they will not rot as other potatoes do. Also, when they are growing they are much stronger to resist frost. There is no comparison between seed saved in this manner and that saved from potatoes that have been allowed to ripen. Potatoes for this purpose must be lifted while they are in vigorous growth, and before any sign of blight appears, as once this disease has shown itself in the haulm the potatoes would not keep if dug green, as the spores from the leaves and the spores on the land immediately affect the tuber that is dug in an immature state. I have no hesitation in saying that the grower who carries out these instructions will increase his crop by at least 40 per cent."

Improvement of Wheat-growing.

At a recent meeting of the Provisional Council of Agriculture a scheme for the betterment of the wheat-growing industry was submitted by Mr H. C. Quodling (Director of Agriculture) for consideration by the Council. The Council approved of the general principles of the scheme, and, recognising the importance and urgency of giving effect to the proposals, authorised the Wheat and General Agricultural Standing Committee to take immediate action. With a view to the initiation of the proposals prior to the conclusion of the present season's planting operations, the Committee met the members of the State Wheat Board and Mr. R. E. Soutter (Manager, Roma State Farm) at a special meeting at Toowoomba.

The proposals submitted by the Director of Agriculture were adopted, and provided, briefly, as follows:—

(1.) That the Wheat Board co-operate with the Department of Agriculture in encouraging the cultivation of certain types of wheat which combine desirable field characteristics with good milling and nutritive qualities, and in eliminating approximately two-thirds of the existing varieties which have proved less reliable;

(2.) That the Wheat Board undertake the distribution of the supplies of seed wheat grown by the Department which have been proved rust resistant and reliable in regard to yields;

(3.) That the approved varieties be distributed for planting in specified classes of soils only;

(4.) That, subject to conditions laid down in regard to the cultivation of such varieties, the Wheat Board purchase on special terms the resultant crop of grain if suitable for seed purposes.

Seeing that the Board controls the purchase and sale of all Queensland-grown wheat, it was agreed that the operation of this scheme would effect a marked improvement in the wheat-growing industry, and that within a reasonable space of time high-class varieties specially suited to local conditions would be cultivated throughout the wheat-growing areas generally.

Organising Maizegrowers.

For many years there has been a steadily growing demand on the part of the maizegrowers of Queensland for some more organised method of marketing their produce. While the wheatgrowing areas are comparatively centralised, however, the centres of the maize industry are widely separated, large quantities being grown on the Atherton Tableland, and in the Burnett, the Downs, and other districts. It is thus apparent that the establishment of a central organisation to safeguard the interests of the whole of the growers of the State is a task of considerable magnitude. Some action, however, is urgently needed, and it will be of interest to the maizegrowers of Queensland to know that the problem in all its phases was considered by the Wheat and General Agriculture Committee of the Council of Agriculture at its first meeting in Toowoomba. After full discussion the Committee were of opinion that the problem is capable of solution, and that a complete organisation of the industry is possible. For the purpose of collecting full statistical information regarding production, it was agreed to ask the Department of Agriculture to circulate immediately a return form (approved by the Committee) on which growers will supply necessary details. When such information has been secured, the Committee propose to formulate a definite scheme for consideration by the Council of Agriculture.

Meat Ants as "Policemen."

Mr. Thos. Simond, Apple-Tree Creek, writes:—"I am only starting cane-growing, and have put in about an acre with hoe and mattock, and have noticed how quickly beef ants are on the job for wood grubs, worms, and other pests. Perhaps ants would be equally efficient as an aid to exterminating cane grubs."

Show Dates, 1922—

Show society secretaries are invited to forward for insertion in this list dates of forthcoming shows. Alterations of dates should be notified without delay.

Bundaberg: 1st to 3rd June.
Marburg: 2nd and 3rd June.
Brookfield: 3rd June.
Cairns: 7th and 8th June.
Gin Gin: 7th and 8th June.
Woombye N.C.A.H.S.: 7th and 8th June.
Mount Larcom: 9th and 10th June.
Gladstone: 15th and 16th June.
Rockhampton: 22nd, 23rd, and 24th June.
Esk: 28th and 29th June.
Mundubbera: 29th and 30th June.

Mackay: 30th June and 1st July.
Gayndah: 4th, 5th, and 6th July.
Nambour: 5th and 6th July.
Townsville: 5th and 6th July.
Charters Towers: 12th and 13th July.
Gatton: 12th and 13th July.
Proserpine: 13th, 14th, and 15th July.
Rosewood: 19th and 20th July.
Caboolture: 20th and 21st July.
Mount Gravatt: 22nd July.
Barcaldine: 25th and 26th July.
Crow's Nest: 26th July.

Pine Rivers: 28th and 29th July.
Wellington Point: 29th July.

Sandgate: 4th and 5th August.
Royal National: 7th to 12th August.
Belmont: 19th August.
Murrumbidgee: 22nd to 24th August.
Coorparoo: 26th August.
Kenilworth: 31st August.

Beenleigh: 1st and 2nd September.
Zillmere: 1st and 2nd September.
Gympie: 7th, 8th, and 9th September.
Wynnum: 9th September.
Imbil: 13th and 14th September.
Laidley: 13th and 14th September.
Sherwood: 16th September.
Rocklea: 23rd September.
Kilcoy: 28th and 29th September.

Esk Camp Drafting: 4th and 5th October.
Pomona, 4th and 5th October.
Southport: 6th October.
Enoggera: 7th October.

Biggenden District Agricultural and Pastoral Society: Thursday and Friday, 29th and 30th June, 1922.

BOWEN.—Bowen Pastoral, Agricultural, and Mining Association: F. Sellars, Secretary; Thursday and Friday, 27th and 28th July, 1922.

INGHAM.—The show dates of the Herbert River Agricultural Association have been altered to 11th and 12th August, 1922.

CERTIFICATES OF SOUNDNESS.

Certificates of Soundness were issued for the following Stallions during the month of May, 1922:—

Name of Stallion.	Breed.	Period for which Certificate was issued.	Owner's Name.	Owner's Address.
Battle Call ..	Blood	Life ..	E. J. Hayes ..	Harrisville
Warbelle ..	Blood	12 months	H. Weirer ..	Bright View, Lowood
Kim II. ..	Pony	Life ..	S. S. McCoombes	Church Hill, Ipswich
Black Eagle ..	Pony	Life ..	J. E. Hastings..	Silkstone, Ipswich
King Rufus ..	Pony	12 months	J. E. Reiser ..	Boonah
Colin Rufus ..	Trotter	Life ..	G. King ..	Salisbury road, Ipswich
Gold King ..	Trotter	12 months	W. Altmann ..	Glamorgan Vale, Ipswich

AN EXPERIMENT IN EGG PRODUCTION.

[From the "Journal of the Department of Agriculture," Union of South Africa.]

REPORT ON THE BUILDING UP OF TESTED LAYING STRAINS.

By J. J. JORDAAN, Poultry Instructor, Glen, Orange Free State.

This report gives my observations, conclusions, and remarks, and sets out the present position in connection with the experiment started at the Glen School of Agriculture in 1915-16 for building up tested laying strains of Speckled Sussex, White Wyandottes, and Silver Campines.

The accompanying table summarises the work done during the period 1st May, 1915, to 31st March, 1921, and while the actual output of eggs is only moderate, the lessons that have been learned are most valuable and form the first step towards the goal the experiment is intended to reach.

The Speckled Sussex and Silver Campines for the experiment were imported from England, and the White Wyandottes were procured from a South African breeder, as well as some other birds that were taken over from the Grootvlei Experiment Farm.

In-breeding of the closest possible nature was adopted up to the time dealt with by this report, so as to fix uniformity in all sections, such as type, colour, size, shape, and numbers in the eggs produced, as it was felt that these fixed characteristics could only be achieved by the above means. Very ordinary food was given the birds doing the test, anything of a forcing nature being most rigorously avoided; no meat or meatmeal was ever allowed, otherwise the numbers would doubtless have been considerably greater.

For the first year trap nests were used. In the second year the single pens were completed and occupied. These measure 20 ft. by 2 ft. 10 in., with house at the back 2 ft. 10 in. wide, 6 ft. deep, and 4 ft. 6 in. high, made of wood with galvanised iron roof. There is a wire-netting division in the house, each sixth division being of ceiling boards.

A nest is made of a paraffin box on its side, resting on bricks. On the top of the box is a bracket on which rests a perch; this passes through the wire-netting and, resting on the bracket on the box in the next run, serves as perching room for four birds, two in each run. The perch is removable, so is the nest, and the top of the nest (box) serves as a dropping board for the manure.

Water is provided in a small vessel suspended from the wire-netting division in the house above the roost. Admission to the house and run is through the back of the house, which is virtually the door.

Grain food is fed in a deep layer of litter on the floor of the house, the litter being kept in by a flap 12 in. high at the front and back of the house. Mash, green food, grit, charcoal, and lime food are given in a small paraffin tin, having hooks made of plain wire, suspended on the inside of the fence, at the front end of the run, a small hole being made in the wire-netting to admit the hand for this purpose. The tin is divided into three sections for mash and green food, grit and shell, and charcoal respectively.

From 1915 to 1919 attention was given solely to the three above-mentioned breeds, but in 1919-20 a start was made to test and build up the strains of some of the other breeds from the stock on the farm. Owing to the limited number of runs the following breeds only could be added:—Light Sussex, White Leghorns, Anconas, Barred Plymouth Rocks.

The result of the test with these, as far as it has gone, is also shown in the summary herewith.

To carry out the enlarged experiment meant placing two birds in a pen originally built for one, with resulting disadvantages, such as lower production, outbreak of vices, and earlier contamination of the soil in the runs. It was thought better, however, in the interests of the institution's stock as a whole to put up with these disabilities than to have no tested record of the producing ability of our breeding stock, for the constant purchase of birds from private breeders is not only expensive but certainly not conducive to the fixing of our own strains and their characteristics.

At the close of March last all the birds were removed from the pens to rest them for twelve months. The pens were dug over and sown with oats, it being intended to dig this crop in as green manure about September and then to resow with some other quick-growing plant which, in turn, will be again dug in about January, the runs to be again resown. It is thus hoped, by the end of next March to have the pens thoroughly fresh and as good as when first erected, if not better, and ready for another five years' occupation.

While a study of the summary shows nothing of a record, it reveals a marked improvement during the first four years in the production of the first three breeds started with, *i.e.*, in the number of eggs laid by the hens in each breed, both those laying the least and the most, together with the average of the numbers tested, showing an improvement each year. This is not quite so apparent or general in the case of the Speckled Sussex, yet improvement there is and of a marked nature, if the results of the first and fourth years (1915-16, 1918-19) are compared.

It is clear therefore that this method of testing and breeding to fix the characteristics aimed at in the strain, and of improving the general or average egg production of a flock or breed so as to render it a fixed strain, is sound.

The drop noticeable in the figures between the fourth and fifth years' records—1918-19 and 1919-20—is attributed to the following reasons:—

(1) The ground in the runs was becoming stale, and this affected the health and stamina of the birds and also their resulting output.

(2) In some cases signs were not wanting that a touch, or slight infusion of new blood, was being called for.

(3) A rigorous selection, not of the largest producers to breed from the previous year as had been done formerly, but of those robust, typical, only moderate layers of good sized eggs in preference to those that gave quantity of eggs lacking size was needed.

It was felt, moreover, that the uniformity first mentioned in the report was fairly well established, and more attention could now be given to the size of eggs produced; that, no doubt, was the main contributary reason for this drop.

For various reasons it was thought best to close the test at the end of March last. Thus the last period was a test for nine months only, but, comparing the results of all the breeds and remembering the state of the ground in the runs, the

records—if taken *pro rata*—again show an improvement over those of 1919-20. The size of egg also improved in this period, due to the matings in 1918-19 and 1919-20.

In spite of the handicaps mentioned, if the twelve-month record for 1915-16 and the nine-month record for 1920-21 are compared *pro rata*, a slight improvement is found, but that is nothing when the general uniformity of the birds and of the eggs now laid are considered.

There now exists in the three breeds first started with a firm foundation in certain fixed characteristics and uniformity. With the discriminate infusion of a little new blood this year, it is anticipated that the next five years' tests on fresh ground, and some knowledge of what is being bred from, will maintain the uniformity that has been fixed, and that the quantity of output will be further improved, but, it is hoped, not at the expense of the size of egg which, for the last two years, has been mainly kept in view.

It is yet too early to remark upon the results of the other four breeds being tested, than to say that the setback in the second year in the Light Sussex is inexplicable, except that the male bird used the first year was purely a show bird and lacked egg-producing qualities, which did not appear to be the case on external characteristics.

SUMMARY.

Year.	Breed and Variety.	No. of Hens completed Test.	Lowest Output from a Hen.	Highest Output from a Hen.	Average Output from Flock.	Remarks.
1915–16	Speckled Sussex.	10	47	140	93·4	Imported stock.
1916–17		3	61	101	82·66	" " First Progeny.
1917–18		10	83	201	135·6	Progeny of above.
1918–19		8	114	154	135	" " two above.
1919–20		12	63	132	101·75	Two birds started to a pen. Selection for improvement in size of egg started.
1920–21		12	25 *(cull)	106	70·92	Nine months' record only.
1915–16	White Wyandottes.	11	76	145	112·73	New stock started with.
1916–17		5	97	145	115·2	Birds bred on farm from above.
1917–18		9	112	196	161	Progeny from above.
1918–19		11	152	210	178·36	" " "
1919–20		9	87	177	124·33	Two birds started to a pen. Selection for improvement in size of egg started.
1920–21		11	77	145	107·36	Nine months' record only.
1915–16	Silver Campines.	12	29	118	67·75	Imported stock.
1916–17		6	56	115	84·33	" " First progeny.
1917–18		8	94	181	128·12	Progeny from above.
1918–19		11	125	204	164·91	" " "
1919–20		10	22†	179	122·2	Selection for improvement in size of egg started. Two birds started in a pen.
1920–21		7	54	113	95	Nine months' record only.
1918–19	Light Sussex.	3	166	212	193·33	Birds exchanged, origin unknown.
1919–20		11	50	85	64·36	Progeny of above.
1920–21		4	58	75	67	" " " Nine months' record only.
1919–20	White Leghorns.	20	142	210	172 55	Bred on farm.
1920–21		23	80	157	121·7	Progeny of above. Nine months' record only.
1920–21	Anconas.	5	101	122	114	Bred on farm. Nine months' record only.
1920–21	Barred Plymouth Rocks.	5	88	128	111·6	Bred on farm. Nine months' record only.

* Purposely tested to demonstrate that culls are useless to keep for students' education.

† Ruptured oviduct. Kept for same purpose as culled Speckled Sussex above.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1922.

The nineteenth egg-laying competition held at the Q.A. College commenced on 3rd April. The competing pens number 70, 44 competing in the light section and 26 in the heavy section. In the case of 40 pens the birds are being tested singly, 28 being light and 12 heavy breeds. The following are the individual records:—

Competitors.	Breed.	April.
LIGHT BREEDS.		
*Bathurst Poultry Farm	White Leghorns	112
*W. and G. W. Hindes	Do.	108
J. H. Jones	Do.	104
*Geo. Trapp	Do.	104
J. Purnell	Do.	101
*S. L. Grenier	Do.	97
H. G. C. Wenck	Do.	97
B. Hawkins	Do.	97
*W. A. Wilson	Do.	92
*O. Goos	Do.	92
*G. Williams	Do.	83
*T. Fanning	Do.	80
B. C. Bartlem	Do.	80
*Mrs. E. White	Do.	77
*N. A. Singer	Do.	76
A. Martin	Do.	73
C. H. Singer	Do.	72
A. Anders	Do.	70
E. Stephenson	Do.	69
*H. Fraser	Do.	65
*J. W. Short	Do.	63
*J. W. Newton	Do.	62
*W. Becker	Do.	60
Brampton Poultry Farm	Do.	59
*C. M. Pickering	Do.	59
*H. P. Clarke	Do.	56
E. Symons	Do.	56
T. H. Craig	Do.	56
G. H. Richardson	Do.	55
*R. C. Cole	Do.	55
*Mrs. L. Anderson	Do.	54
*C. Goos	Do.	54
N. J. Nairn	Do.	52
*J. M. Manson	Do.	52
*E. A. Smith	Do.	44
*R. Gill	Do.	40
*Oakleigh Poultry Farm	Do.	38
*R. C. J. Turner	Do.	36
H. Trappett	Brown Leghorn	34
*M. F. Newberry	White Leghorns	33
*Mrs. R. E. Hodge	Do.	29
*F. Birchall	Do.	29
*Thos. Taylor	Do.	6
Parisian Poultry Farm	Brown Leghorn	0
HEAVY BREEDS.		
J. Hutton	Black Orpingtons	130
Mrs. A. Kent	Do.	128
Wombo Poultry Farm	Do.	120
*A. E. Walters	Do.	113
*R. Holmes	Do.	97

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	April.
HEAVY BREEDS—*continued.*		
*R. Burns	Black Orpingtons	86
*Rev. A. McAllister	Do.	82
*Jas. P tter	Do.	80
V. J. Rye	Do.	72
Mrs. L. Maund	Do.	72
Mrs. A. E. Gallagher	Do.	71
H. B. Stephens	Do.	61
*H. M. Chaille	Do.	60
Jas. Hitchcock	Do.	59
R. Innes	Do.	51
*T. Hindley	Do.	44
*E. F. Dennis	Do.	34
*Parisian Poultry Farm	Do.	33
C. Rosenthal	Do.	23
W. Becker	Chinese Langshans	16
W. C. Trapp	Black Orpingtons	12
C. Doan	Do.	12
*J. E. Smith	Barred Rocks	11
*C. C. Dennis	Black Orpingtons	1
*Miss L. Hart	Rhode Island Reds	1
R. Burns	Silver-laced Wyandottes	0
Total		4,300

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Bathurst Poultry Farm	14	16	17	23	23	19	112
W. and G. W. Hindes	19	17	20	15	18	19	108
G. Trapp	18	7	21	18	18	22	104
S. L. Grenier	14	13	16	17	17	20	97
O. Goos	16	11	12	24	15	14	92
W. A. Wilson	14	12	12	19	20	15	92
G. Williams	13	13	19	12	12	14	83
T. Fanning	16	14	8	17	18	7	80
E. White	20	10	8	9	17	13	77
N. A. Singer	5	10	17	21	10	13	76
H. Fraser	11	17	11	14	6	6	65
J. W. Short	16	9	10	18	1	9	63
J. W. Newton	15	16	8	5	13	5	62
W. Becker	0	6	19	14	5	16	60
C. P ckering	11	15	11	4	10	8	59
H. P. Clarke	14	0	12	5	15	10	56
R. C. Cole	7	16	21	4	2	5	55
C. Goos	9	5	6	9	7	18	54
Mrs. L. Andersen	10	1	8	15	10	10	54
J. M. Manson	15	4	5	6	14	8	52
E. A. Smith	12	2	9	11	2	8	44
R. Gill	9	3	3	2	7	16	40
Oakleigh Poultry Farm	0	1	1	11	5	20	38
R. C. J. Turner	4	0	13	10	3	6	36
M. F. Newberry	3	2	10	14	3	1	33
Mrs. R. Hodge	11	0	2	9	2	5	29
F. Birchall	1	4	2	10	3	9	29
Thos. Taylor	1	0	2	2	0	1	6

DETAILS OF SINGLE TEST PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
A. E. Walters	21	13	23	17	23	16	113
R. Holmes	11	24	9	19	14	20	97
R. Burns	17	12	5	22	14	16	86
Rev. A. McAllister	15	20	20	9	6	12	82
J. Potter	6	17	16	23	17	1	80
H. M Chaille	18	6	16	20	0	0	60
T. Hindley	0	1	2	20	19	2	44
E. F. Dennis	0	0	18	2	2	12	34
Parisian Poultry Farm	2	11	3	6	1	10	33
C. C. Dennis	0	1	0	0	0	0	1
Miss L. Hart	0	0	1	0	0	0	1
J. E. Smith	0	2	7	0	0	2	11

CUTHBERT POTTS,
Principal.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR APRIL, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Gay Lassie ...	Ayrshire ...	20 Feb., 1922	1,080	4·5	57 00	
Prim	Holstein ...	9 Feb., ,,	1,200	3·5	48·90	
Little Buttercup...	,, ...	12 Dec., 1921	960	4·0	45·00	
Snowflake	Shorthorn...	20 Feb., 1922	840	4·3	42·30	
College Cold Iron	Jersey ...	25 Jan. ,,	660	5·0	39·00	
Maguet's Leda ...	,, ...	8 Feb. ,,	720	4·6	39 00	
Lure	Ayrshire ...	8 Jan. ,,	840	3·8	37·50	
Skylark	,, ...	7 Feb. ,,	870	3·7	37·50	
Auntie's Lass ...	,, ...	31 Oct., 1921	750	3·7	32·40	
Lady Annette ...	,, ...	2 Jan., 1922	660	4·2	32·40	
Hedges Madge ...	Holstein ...	15 Aug., 1921	660	4·2	32·40	
Lilia	Ayrshire ...	3 Mar., 1922	690	3·9	31·20	
Buttercup	Shorthorn...	28 Oct., 1921	720	3·3	30·00	
Thyra of Myrtle-view	Ayrshire ...	31 July, ,,	570	4·2	28·20	
Glow VI.	Guernsey ...	28 Aug. ,,	450	5·2	27·60	
College Ma Petite	Jersey ...	5 Feb., 1922	570	4·1	27·30	
College Bluebell ...	,, ...	22 Oct., 1921	540	4·2	26·70	
College St. Margar t	,, ...	25 Sept. ,,	420	5·2	25 80	
College Evening Glow	,, ...	10 Oct. ,,	450	4·9	25·80	
Lady Meg ...	Ayrshire ...	25 Jan., 1922	570	3·8	25·50	
College Wildflower	Jersey ...	10 Dec., 1921	450	4·8	25·20	
Lady Mitchell ...	Holstein ...	21 Dec. ,,	510	4·2	25·20	
College Prima Donna	,, ...	17 Nov. ,,	630	3·4	24·90	
College Nita ...	,, ...	26 Feb., 1922	570	3·4	22·50	
Miss Security ...	Ayrshire ...	20 Aug., 1921	510	3·7	21·90	
Lady Loch II. ...	,, ...	31 Jan., 1922	450	4·0	21·00	

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1922 AND 1921, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1922.	April, 1921.
North Coast.	In.		In.	In.
Atherton	4·67	21	2·14	11·59
Cairns	12·20	40	11·85	19·72
Cardwell	9·86	50	3·92	3·38
Cooktown	9·24	46	7·68	5·99
Herberton	4·43	35	1·89	7·64
Ingham	9·00	30	4·58	3·07
Innisfail	21·90	41	10·27	19·93
Mossman	12·46	14	6·13	11·86
Townsville	3·90	51	0·27	0·32
Central Coast.				
Ayr	2·94	35	0·02	0·31
Bowen	2·95	51	0·13	0·23
Charters Towers ...	1·80	40	0·05	0·27
Mackay	6·86	51	2·54	3·20
Proserpine	6·92	19	2 51	4·89
St. Lawrence ...	2·84	51	0·61	0·44
South Coast.				
Biggenden	1·78	23	0·09	4·01
Bundaberg	2·94	39	0·50	8·81
Brisbane	3·59	71	0·27	8·06
Childers	2·53	27	0·57	8·47
Crohamhurst ...	5·70	30	1·72	14·66
Esk	2 69	35	0·07	4·85
Gayndah	1·32	51	Nil	1·07
Gympie	3·15	52	0·30	6·76
Glasshouse M'tains	5·18	14	...	9·31
Kilkivan	2·11	43	Nil	3·69
Maryborough ...	3·37	51	0·12	9·76

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1922.	April, 1921.
South Coast—continued:	In.		In.	In.
Nambour	5·08	26	1·36	11·52
Nanango	1·87	40	0·07	1·94
Rockhampton ...	2·29	35	0·78	1·21
Woodford	4·24	35	0·88	8·94
Darling Downs.				
Dalby	1·26	52	Nil	0·15
Emu Vale	1·20	26	0·05	1·27
Jimbour	1·30	34	Nil	0·19
Miles	1·42	37	Nil	0·13
Stanthorpe ...	1·71	49	0·49	1·48
Toowoomba ...	2·51	50	0·24	3·27
Warwick	1·67	57	0·05	1·17
Maranoa.				
Roma	1·28	48	Nil	Nil
State Farms, &c.				
Bungeworgorai ...	0·86	8	Nil	0 01
Gatton College ...	1·69	23	0·02	1·83
Gindie	1·24	23	Nil	0·08
Hermitage ...	1·32	16	0·03	0·64
Kairi	5·55	8	3·01	14·70
Sugar Experiment Station, Mackay	5·43	25	2·15	2·76
Warren	1·34	8	Nil	0·85

NOTE.—The averages have been compiled from official data during the periods indicated; but the tota for April this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

Orchard Notes for July.

THE COAST DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded, good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to fix standards of quality and see that the fruit offered for sale complies with the standards prescribed and that the cases are marked accordingly.

Where the crop has been gathered, the trees can be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning out of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree, cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree, and when the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer parts a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that can be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees can be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated, but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

Land intended for bananas and pineapples can be got ready, and the existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for sending South can be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales, when they may be injured by the cold.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from black heart (the result of a cold winter) or from fruitlet core rot, they can well, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former, and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing, well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before spring growth starts.

With regard to pruning, follow the advice given in the June number; and if you are not thoroughly conversant with the work, get the advice of one or other of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out, it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruit on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth, and on spurs; but peaches and nectarines always on wood of the previous season's growth, as once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime-sulphur.

All kinds of deciduous trees can be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting can be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm and Garden Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine, and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early flowering period—*i.e.*, when about one-third of the plants in the crop are in flower.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, holly-hocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, coxcombs, pholxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	APRIL.		MAY.		JUNE.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·2	5·50	6·18	5·20	6·36	5·3
2	6·3	5·49	6·18	5·19	6·36	5·3
3	6·3	5·48	6·19	5·18	6·37	5·3
4	6·4	5·47	6·20	5·17	6·37	5·3
5	6·5	5·45	6·21	5·17	6·38	5·2
6	6·5	5·44	6·22	5·16	6·38	5·2
7	6·6	5·43	6·22	5·16	6·39	5·2
8	6·6	5·42	6·23	5·15	6·39	5·2
9	6·7	5·41	6·23	5·14	6·40	5·2
10	6·7	5·40	6·24	5·14	6·40	5·2
11	6·8	5·39	6·25	5·13	6·41	5·2
12	6·8	5·38	6·25	5·13	6·41	5·2
13	6·9	5·37	6·26	5·12	6·42	5·2
14	6·9	5·36	6·26	5·12	6·42	5·2
15	6·10	5·35	6·27	5·11	6·42	5·3
16	6·10	5·34	6·27	5·10	6·42	5·3
17	6·11	5·33	6·28	5·10	6·42	5·3
18	6·11	5·32	6·28	5·9	6·43	5·3
19	6·12	5·31	6·29	5·9	6·43	5·4
20	6·12	5·30	6·29	5·8	6·43	5·4
21	6·13	5·29	6·30	5·8	6·43	5·4
22	6·13	5·28	6·31	5·7	6·43	5·4
23	6·14	5·27	6·31	5·7	6·43	5·4
24	6·14	5·26	6·32	5·6	6·44	5·4
25	6·15	5·25	6·32	5·6	6·44	5·4
26	6·15	5·24	6·33	5·5	6·44	5·5
27	6·16	5·23	6·33	5·5	6·44	5·5
28	6·16	5·22	6·34	5·4	6·44	5·5
29	6·17	5·22	6·34	5·4	6·44	5·5
30	6·17	5·21	6·35	5·3	6·44	5·6
31	...	...	6.35	...	...	...

PHASES OF THE MOON, OCCULTATIONS, &c

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer Time" is not used.

		H. M.
5 April	☾ First Quarter	3 46 p.m.
12 „	○ Full Moon	6 44 a.m.
19 „	☽ Last Quarter	10 54 a.m.
27 „	● New Moon	3 4 p.m.

Perigee on 10th at 6·36 p.m.
Apogee on 22nd at 8·12 p.m.

The moon will pass, apparently, close to Jupiter on the 11th soon after sunset. If viewed from a higher southern latitude the moon will be seen to occult the planet.

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4 May	☾ First Quarter	10 56 p.m.
11 „	○ Full Moon	4 6 p.m.
19 „	☽ Last Quarter	4 17 a.m.
27 „	● New Moon	4 4 a.m.

Perigee on 8th at 5·12 p.m.
Apogee on 20th at 2 30 p.m.

On the 8th, between 11 and 12 p.m., the moon will be again very near, apparently, to Jupiter in the constellation Virgo, with the very interesting binary star—Gamma Virginis—slightly below them.

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3 June	☾ First Quarter	4 10 a.m.
10 „	○ Full Moon	1 38 a.m.
17 „	☽ Last Quarter	10 3 p.m.
25 „	● New Moon	2 20 p.m

Perigee on 4th at 5·12 a.m. and on 29th at 1·24 p.m.
Apogee on 17th at 9·18 a.m.

The moon will pass Saturn on the 4th at a quarter past three in the afternoon, and will enable this planet to be seen in the daytime if a small telescope or binoculars are directed about six times the moon's diameter northward. It will also pass Jupiter on the 5th a little before four o'clock in the morning, again in apparent proximity to Gamma Virginis. Jupiter will again be occulted in high southern latitudes.

Venus, Jupiter, and Saturn will be evening stars during these three months. Mars will be somewhat later in rising, but will be visible early in the evening during the latter part of the period.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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